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LIGHT HEAT POWER BYE-PRODUCTS

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EDITORIAL NOTES.

The Government Electricity Scheme.

THE summary of the Government's Electricity Bill, published in last week's issue of the "JOURNAL," will have been studied with considerable interest by our readers; but we venture to say that the interest of the electricity industry in the Bill will far transcend that of men in any other sphere, and so will their objections. When the Prime Minister adumbrated the electrical plans whereby the Government propose to bring about a reformation of electricity supply in this country, he hinted that it would be necessary to wait for the details until the Bill was published. This having come to pass, it is found that the outline of the scheme which Mr. Baldwin gave was a faithful one; the details which the Bill has disclosed are merely auxiliary to the main parts of the scheme as pictured by him. Though merely auxiliary, they reveal a condition of things which will, in our opinion, be highly repugnant to the electricity industry—a condition of things both autocratic and financially burdensome upon the existing undertakings, which burden, according to the Weir Report, will continue to grow throughout the next fifteen years. In short, the scheme has been cleverly designed with a view to adding heavily to the financial obligations of a comparatively few electricity stations, ostensibly for the benefit of the many, without the owners of those stations receiving any really material benefit, while, on the other hand, removing their present freedom of action, and placing their administrative procedure under control and direction in a manner which is inconsistent with their financial and managerial responsibilities. The representations of Cabinet Ministers that there would be as little control as possible, either shows an inappreciation of what control and compulsion mean, or that they are the possessors of a big fund of jocularity. We hesitate to think what may be the effect of the proposed close association of the technical and productive operations of the industry and a Government Department in the event of a change in political power.

The contemplated Central Executive Board appear to be the connecting link between bureaucratic control and the owners of the sixty or so generating stations which are destined eventually to supply electrical energy throughout the country. The Board will also in a sense merely "devil" for the Electricity Commissioners—will do for them the rough work, that august body sits the while in judgment on all their doings. "It shall not be lawful for the Board" to do this or that without the approval of the Electricity Commissioners; and "approval," "determination," "confirmation," "consent by," and "to the satisfaction of the Electricity Commissioners" peep out at the electricity industry from practically every one of the thirty-two printed pages of which the Bill is composed. And the Electricity Commissioners are a component of the Ministry of Transport! If this is not bureaucratic control, then we do not know what the term means. It would, in fact, be difficult to design any scheme which gives more complete control over the doings of the electricity industry than is found in this measure It is certainly a legislative innovation. Never before has a British industry been singled-out in this way for having imposed upon it a scheme of control which subjects its primary work to the unfettered discretion of a few men as represented, in the first instance, by the Central Executive Board, and, in the second, by the final determining body—the omnipotent Electricity Commissioners. There is to be no higher authority than the Electricity Commissioners. This is seen in Clause 4, sub-section 3, which provides that, as soon as a scheme "is confirmed by the Electricity Commissioners, or is confirmed as respects any area, it shall be the duty of the Board to carry out and give effect to the scheme." The Central Executive Board will be a paid body, with secretary and all necessary officers and staff. We have no doubt that the members of the Board, being technically qualified men, will have to be paid a considerable remuneration; and that the expenses of their staff and operations will not be a negligible quantity. The same applies to the Electricity Commissioners, who, with the additional responsibilities of approval, determination, confirmation, consent, and obtaining satisfaction, will have the range of their work increased, and so probably the present cost of maintaining that body will have to be extended.

Should the Bill go through, and become an Act of Parliament in its present form (which we should imagine is somewhat doubtful), the owners of the largest stations in the country will begin to wonder whether their stations will come within the group of "selected" ones, or whether their plants will be marked for ultimate dismantling and scrapping when they have been allowed to decline to an obsolete state. According to the Weir Report, the recommendation was that 43 of the existing stations should be selected, that 15 new ones should be erected, and that 432 existing stations should eventually be closed down. The selected stations are to be worked by their present owners on behalf of the Board; but what reward are they to get for so operating them? According to the Bill, the Board are to rule the operation of the stations, and are to direct extensions and alterations. But if the owners consider that the directions of the Board are unreasonable, then they may appeal to the Electricity Commissioners, and (if thought desirable) subsequently to the Railway and Canal Commissioners. This is the only instance in the Bill where provision is made for a superior court of appeal from the Electricity Commissioners. Possession of the selected stations—controlled and dominated in this way—can only be retained by the owners by a submissive carrying out of the instructions given to them by the Board. Failure to do this would entitle the Board to acquire the generating station at a price to be determined in accordance with provisions which are defined in the first schedule to the measure; and then the Board could make arrangements for the operation of the acquired station as they considered right and proper, in accordance with the Act. Respecting new selected stations, these are also to be provided by authorized undertakings if an arrangement can be effected for the purpose. Otherwise, the Commissioners may by Special Order authorize the Board to provide a station themselves. In other words, as much financial responsibility as possible is being placed on existing authorized undertakings, although control is virtually to be vested in the Board, together with directions as to alterations and extensions. The owners are, as already said, to generate and operate according to the directions of the Board; then they are to sell the electricity to the Board at a price to be determined in accordance with rules scheduled to the Act. To make the complication more pronounced, the owners are to purchase from the Central Board the electricity generated by the

former, to the extent required for their area, at a price also to be determined in accordance with the Act, which price is to include part of the Board's expenses, and interest and sinking fund on capital outlay needed by the Board for carrying out the work assigned to them by the Act. Never before have more Gilbertian proposals been included in any parliamentary enactment.

Further functions of the Board are to include provision for main transmission and interconnection of the selected stations with the systems of other authorized undertakers. They are to be given the power to construct and lay down all the necessary lines for transmission and interconnection, or to purchase transmission lines belonging to present authorized undertakers. The Board are likewise to provide for the standardization of frequencies; and they may require the owners of any selected station to amend or alter the frequency as may by the Board, with the approval of the Electricity Commissioners, be thought expedient. But this is subject to the payment to the authorized undertakers or owners of any expenses they may properly incur in carrying the changes into effect, including the cost of altering or replacing plant belonging to consumers.

Turning to the conditions of the Bill which deal with the supply of electrical energy to authorized undertakers whose plants will eventually be discarded. They had better betimes look after their interests, in view of the nature of the clauses of the Bill which apply to them. In their case, if the Central Board consider that the provision of transmission lines required for their supply would, having regard to the supply needed, entail unreasonable expense, the Electricity Commissioners may authorize the Board to impose such terms and conditions as the Commissioners may think fit. Another thing the Board may do, in a case in which an undertaking demands a supply and owns a generating station, is to make it a condition of furnishing the supply that the undertakers shall take the whole quantity of electricity required for their undertaking directly or indirectly from the Board. That in some cases would probably bear very hardly upon the owners of such stations. As to the price which would be charged, this would be a tariff fixed so that the receipts on the Board's income account would be sufficient to cover expenditure on income, including interest and sinking fund charges, with such margin as the Electricity Commissioners may allow. It is easy to see that, with the generating expenses, the Board's outgoings, and the transmission, interconnection, and transformation costs, the price of current will not be that at which many of the stations can themselves generate. In this connection, a point of interest is that the Board are not, for a period of seven years, to charge the owners of selected stations more than the cost at which they could have generated a like quantity of electricity. Some of the selected stations are already generating at a very low figure. This being so—and they are not likely to get appreciably lower in their costs—it follows that, during the seven years (the selected stations being the largest producers), other undertakings will have to bear, so it seems to us, a considerable share of the working expenses of the Board, and the charges for interest and sinking fund on the Board's capital expenditure on transmission and interconnecting lines and transformation plant. Another instance of autocratic power being conferred on the Board is found in the clause which authorizes them to notify any undertaking owning a generating station (not being a selected one) that they are in a position to supply, directly or indirectly, the whole of the electricity required for the undertaking on specified terms. If the Board are satisfied that those terms are below the then prevailing costs of the undertakers, and they refuse, within three months after the notification, to agree to take a supply from the Board, then, if the Electricity Commissioners are satisfied, in respect of the next subsequent year, that the cost of production of electricity generated by those undertakers substantially exceeds the cost they would have incurred had they purchased from the Board the like quantity of electricity on the specified terms, the Commissioners "shall," by Order, require those undertakers to make such abatement from the rates and charges for electricity the ensuing year that the estimated aggregate amount of the abatement will be as near as may be equal to the sum of such excess. Further, those undertakings will not be allowed to increase their then existing rates or charges for electricity without the consent of the Commissioners. In calculating the cost of production at such electricity generating station, no account is to be taken of the interest and sinking fund charges in respect of capital expended on the undertaking. The punishment is heavy. The proposal, if permitted, will deprive those undertakings of their existing liberty, and apply to them dictation and compulsion on the part of the few men constituting the Board and the Commissioners. If the electricity industry consents to such arbitrary control of any of their undertakings, and does not fight tooth and nail to prevent legislation of the kind being passed, it deserves to be governed in the absolute manner suggested. We suppose it will be said this is in the public interest. It might not be in the long-run. Supposing the administrators of one of these undertakings are of opinion that, in the course of a year or two, they would be able to generate at a lower cost than that at which the Board could supply them, they would, through these powers, have removed from them the ability to do so, unless prepared to incur punishment by the Commissioners.

Regarding the financial proposals, the Central Executive Board are, in the first instance, to be limited to the borrowing of £33,500,000; and the Treasury are to be empowered to guarantee the payment of interest and principal of any loan proposed to be raised by the Board up to the amount mentioned. That amount, it is pretty clear from the Weir Report, is only the beginning of a gigantic expenditure. The Weir Committee stated that the technical scheme would involve, during the next fifteen years, new money to the extent of upwards of £250,000,000. Half of this they calculated would be required for distribution purposes. The guaranteed capital which they considered necessary to place the interconnecting system on a paying basis was £25,000,000; and this leaves £100,000,000 for the erection of new or the extension of selected generating stations. The £100,000,000 is the amount which they computed would have to be raised by the authorized undertakings. The capital expenditure of existing authorized undertakings amounts to £161,750,000; and if the Weir Committee is right, then the capital of the industry will be increased in fifteen years by £250,000,000 less any repayments. The electricity industry will no doubt regard this as a serious imposition. The statutory part of the gas industry, which provides many times the heat energy distributed by the electricity industry, has, according to the latest issued returns of the Board of Trade, a total paid-up share, stock, and loan capital of only £168,405,774. Of this sum £31,746,240 has been repaid by local authorities, or is in sinking funds—leaving the outstanding capital of authorized gas undertakings at £136,659,534. The capital expenditure of an industry has an important bearing upon the price of the commodity or commodities it purveys.

We do not know whether the power companies will regard with satisfaction certain provisions in the Bill concerning their existing rights; but we hardly think they will have those rights interfered with without a good struggle for their retention, or at any rate doing their level best to refrain from commencing to receive a supply of electricity from the Board. Should they be compelled to obtain a supply from the Board, then the Minister of Transport may revise the maximum prices authorized by their Special Acts (other than for supplies in bulk to authorized undertakers); and he may also revise the standard prices fixed by those Acts, and, in such revision, regard is to be paid to the benefit to the company of any reduction in the cost of electricity attributable to the present measure. Moreover, where a power company's Act authorizes them to make good any deficiency in any previous dividends which have fallen below the prescribed standard rates, the Electricity Commissioners may, after inquiry, by Special Order, make provision for the repeal or limitation of any such authorization. They may also, where a supply is taken directly or indirectly from the Board by authorized undertakers not being a power company, make provision in respect of the relation between the charges to be made for electricity and the dividends to be paid by the Company, which suggests the application of the sliding-scale, as is being done in the case of the London Electricity Companies.

At one time, there was talk of including in the Bill a proposal to enable the establishing of some mutually beneficial relationship between the gas industry and the electricity industry. This we looked upon as extremely problematical, in view of the attitude which the Electricity Commissioners have taken towards the gas industry in more than one respect, but which attitude is distinctly condemned by the recent report of the Royal Coal Commission. In the Bill there is not the slightest indication of any relationship being instituted between the gas and electricity industries, unless we can read into Clause 21 some idea that gas undertakings may find it worth their while to become contributors to the common pool of electricity to be distributed about the country. The clause enacts "that the Board and any company or person producing electricity by means of the utilization of water power, waste heat, or otherwise, may enter into arrangements for the purchase by the Board of any surplus electricity which the company or person may be able to dispose of on such terms as may be agreed."

It will be interesting to watch the development of the attitude of the electricity industry itself towards the Government scheme. We should imagine that that attitude will be strongly against it from the points of view of bureaucratic control, compulsion, overwhelming financial obligation, the vagueness of the whole plan, and its ultimate results upon the cost of supply to the consumers. We venture to think that the Bill will be keenly contested. In every part it is highly controversial; it entrusts the industry largely to the keeping of a few men; and nothing but a miracle, many will say, could make it subscribe to the economy of the country. If it cannot do this, if it cannot succeed more than normal development would do, then it will fail in the only purpose which could justify it.

The Only Way.

THE trouble confronting the League of Nations, and the introduction of the Electricity Bill (which political and other visionaries thought was going to work miracles in restoring prosperity to our industries, until rational admonition pulled them up, and caused them to temper their beliefs) have not done anything to modify the interest which the report of the Royal Commission on the Coal Industry has aroused in the country. That is at the moment the one and chief concern of a domestic nature; and such matters as the Electricity Bill (for which no urgency can be claimed) ought to wait until the coal question has been disposed of, if that devoutly wished-for consummation can be achieved. Then the electricity scheme could be considered in the light of the expressions of view and the recommendations which are found in the Coal Commissioners' report, and which were the subject of a large part of the first editorial article in the "JOURNAL" last week.

A programme of procedure on the coal report has been developing during the week. A Cabinet Committee has been set-up to deal with it, with the Prime Minister as Chairman. It is believed that, other than the point as to the subsidy, the recommendations will be completely adopted; and as regards the subsidy, the idea is gaining ground that the Government will offer the industry financial help in the shape of a State loan, to be repaid by the industry as soon as it has completed its reorganization, or is in a position to liquidate the debt. To-day the representatives of the coal owners and the miners, at the invitation of the Prime Minister, will have an interview with him at Downing Street; and to-morrow the mine owners and the miners will be holding a joint conference. Meanwhile, members of the Government, the coal owners, and the Miners' Federation and the districts have been faithfully complying with the appeal of the Premier to study carefully this multiplex document, so as thoroughly to digest its warnings, lessons, counsel, recommendations, and their bearings before coming to a decision. It is not a question of any of the three chief parties concerned waiting to see what one proposes before making a move. The report carries us past that sort of action. The business of the owners and miners is the study of the document with the salient fact in mind that to lift the industry from its present deplorable plight, and to fit it for meeting in future the newly established economic factors, something contributory has got to be done. The "something" must be of a drastic nature, and be brought about by give-and-take by all the parties concerned. The more the report is studied, the clearer it becomes that, unless there is concerted action, matters will go from bad to worse, and all with part or lot in the industry—the miners particularly—will suffer. To get into conditions that will put the industry on the road to prosperity again, sacrifices have to be made all round. That it is so is particularly plain in the final chapters of the report—notably Chapter 21—which we review elsewhere this week, to complete our indication of the contents commenced last week. This concluding part shows in a conclusive manner from which there is no escape that the new economic circumstances demand that the components of the industry must be curtailed and compressed to dimensions appropriate to the demands upon it. The facts are solid; the method of stating them pierces home by its very coldness and directness. The necessity for dealing with those facts is stated with an assurance and precision which leave no option but acceptance. Nothing but the worsening of things could be served by neglecting to compose the industrial conditions to the economic ones. If this is not done, the industry will not become financially sound or employment in it secure.

While it is not recommended that the hours of the miners shall be lengthened unless desired by both miners and owners, it is stated that, with the retention of the present hours, a revision of the "minimum percentage addition to standard rates of wages" fixed in 1924 at a time of temporary prosperity is indispensable. Uneconomical collieries must be closed, and amalgamations must be effected of some of the smaller ones with the larger ones. Many pits are being worked inefficiently, and therefore uneconomically, owing to the decline of their physical conditions. These must not be allowed to continue to be a drag on the better circumstanced parts of the industry. In short, there must be a contraction of the industry, including employment in it (which has increased by more than 10 p.ct. since 1909-13), so as to bring its size into proper proportion to requirements. Recommended, too, is a gradual incorporation of the men as shareholders in the industry, by providing that hereafter of all profits distributed above standard dividends on existing capital a fixed proportion be reserved as shares to be issued to the employees, having regard to the service rendered by them. In these matters both owners and miners are concerned. There must be realization of them; and they must be dealt with. That is the only solution that can be found to the problem of restoring prosperity to the coal industry.

Contrasts in Ideals and Demonstration.

SINCE we were at the Ideal Home Exhibition twelve months ago, there has been no radical change in the design of gas-using appliances; but this year's display shows us that, through improving detail, constant progress is being made in utility, working efficiency, and general appearance. There are only two real labour-saving agents for lighting and heating in the ideal home—gas and electricity; and fortunately for the gas industry, at this year's exhibition the electricity industry has its stand close to that of the Joint Exhibit of the Metropolitan and Suburban Gas Companies. Thus in the matters of efficiency, working utility, and appearance of apparatus, the public are in the position of being able to make almost direct comparison. This is an excellent arrangement, for which the gas industry is the debtor of the electrical industry.

In the first place, if visitors look, as no doubt many have done, and will still do, at the lighting fittings, the artistic merit of those used with gas shows that the electricity industry has nothing which presents superiority. There is not the slightest need to-day to have the modern inverted gas-burner, with pretty globes available, supported by ugly fittings of an age long past. Also the lighting effects are shown to be equal to the demonstration of what our electrical friends consider to be unapproachable excellence; while the quality of the light that gas gives unquestionably surpasses that of our rival. In this connection, we have a novelty—a product of the laboratories of the South Metropolitan Gas Company,

Gas light has always been the superior of the electric light in its closer approximation to daylight; but in latter years electric lamps have, by auxiliary means, been utilized to give a light approaching that of daylight for use in industrial and trade directions in which colours require to be examined, tested, and dealt with in a light resembling that of day. The South Metropolitan Company have now produced mantles (this is the first time of public showing) which give a light ranking with the natural light of day, and there should be a considerable demand for such mantles for places where a proper visual interpretation of colour is needed.

Comparison carried into cooking, heating, and hot water supply also shows that in every department gas has a greater utility range. This is obvious from a mere inspection. Modern developments of the gas cooker have been in the dual direction of increasing thermal efficiency and working efficiency, and the one is as important as the other. In these directions a great deal of success has been achieved, and research proceeds with the view of still further improving the cooker in both respects. In connection, however, with the electric cooker, it is well known that, while oven work is not bad, the hotplate parts of the equipment and the heating elements inside the oven are liable to be put out of action at all sorts of inconvenient times. Some types of electric cookers admittedly give a worse account of themselves than others in these respects. Modern gas fires also demonstrate a large heating range for all purposes and any situation, though there are no new designs to be seen at the Ideal Home Exhibition. The same may be said of the ordinary bar electric fires. There are no visible advances in these; and controversy still goes on regarding the deterioration and uncertainty of most of the forms of element. An imitation coal fire is seen in the electric house. It is a demonstration of what not to do. In the dining-room on the gas stand, there is a log fire which is as realistic as anything can be; and it has attracted considerable attention, and caused many inquiries. A photograph was reproduced in last week's "Journal." We should not like to say what is the efficiency of this fire; but we can imagine that there is a large field for it in houses where a little extra expense for comfort and effect is no object. This fire is another of the "Metro" productions; and it is the nearest approach to the actual thing that we have ever seen. The logs are of fireclay; and they show that art can cheat the eye by utilizing one of the materials of Nature to represent another. The inner glowing logs seen through the outer ones look as though they were about to be quickly reduced to ashes, while golden flames play about the outside of the logs, and curl away after the fashion of a real wood log fire. It is an extremely attractive production; and it pleases us in a way that log fires have never done hitherto. The poor imitation "coal fire" in "Electra House" shows how not to do things if ridicule is not to be courted. During our inspection of the electrical exhibit, it was noticed that people put their hands down to feel the "heat," smiled at each other, and passed on. Again the comparison in water heating had only to be made—on the one stand to persuade as to utility, and in the house to warn the public not to be foolish.

We do not want to be more critical of the display of our electric friends, except to use it as a caution how not to do things in demonstration if it is desired to make the display reach its objective. The object of "Electra House" is to advertise the doings of electricity to-day, but the chief feature of it is the utilization of two of the largest rooms in demonstrating how lighting and heating and kitchen work used to be done at least three-quarters of a century ago; the object, of course, being to show the public by contrast how far advanced the world has got through the applications of electricity. These two early Victorian rooms (which admittedly are exceedingly well done) are the attractions of the house—so much so that, passing with the stream of people, it was noticed that the ancient almost monopolized attention, while the modern received the scantiest notice. This was not to be wondered at. In the interests of the electrical equipment and more circulating space, it would have been better had these rooms not been there. To designers of means for staging displays of the kind, the Electrical Development Association, in our opinion, have on this occasion supplied an object-lesson of what to avoid; and yet the promise was that they were going to surpass themselves at this year's Ideal Home Exhibition. They have surpassed themselves in novelty, but the novelty is subversive to the actual intentions of the display. In other words, the primary object has by the novelty been forced into the background.

Fuel Technology and Organization.

For years it has been realized by the comparatively few that one thing that is imperatively necessary in the national and industrial economy is the efficient production and utilization of fuel—a matter deeply interesting to the gas industry, as users of approximately 18 million tons of coal a year and several million gallons of gas oil, and as distributors of (roughly calculated) 1,400,000,000 therms in gaseous form, and 2,240,000,000 therms in the form of solid fuel (together 3,640,000,000 therms), to say nothing of the thermal value of certain products of the tar. The gas industry is persuaded that the efficiency of its processes and of the utilization of its products is a matter of no small concern nationally and in its own interests. This being so, it cannot be otherwise than pleased at the many evidences of a large awakening throughout the country to the problem of the efficient production and utilization of fuel. In the work of promoting this interest, we must give large credit to the Society of Chemical Industry and the Chemical Engineering Group of that Society, through what was done before and at the Leeds and Sheffield conferences. But we have now arrived at a stage where we hope that, owing to developments, a division of effort will not be detrimental to the good so far accomplished. An overlapping of investigation, instead of a thorough co-ordination, would undoubtedly contribute to uneconomy and inefficiency in the beneficial work in hand. There is in existence the Institute of Fuel Economy Engineers. In our issue of March 10, we reported the proceedings at the meeting, at the Institution of Civil Engineers, of many leading men in engineering and chemistry at which the proposal was discussed to found an Institution of Fuel Technology. It was agreed that this should be done; and an Organizing Committee was appointed to define specifically the objects of the work of the Institution. To-day we publish a letter from Mr. W. J. U. Woolcock, the President of the Society of Chemical Industry, relating to a decision to establish within the Society a Fuel Section. We look sympathetically on all these efforts; but at the same time we have a fear that, unless at once they are brought to a common centre, there will be, through overlapping of endeavour, a great deal of waste of energy, work, time, and money which might be better employed in the advancement of a common cause. Ultimately there will be recognition that the sensible course would have been to come together *ab initio* for the general good, and such a course will be taken.

We have nothing constructive to offer; at the moment we frankly confess that, in regard to these movements to organization, we are sitting on the fence. There are friends of ours identified with each movement, all animated by a desire to do the best possible in furthering a cause which they have closely at heart. We may, however, express the hope that good counsel will prevail, in order that the widest possible interests may be served, and the maximum good be achieved. On our part, there is objection to the formation of any new organization, unless a virgin field of usefulness presents itself. In this case we have such a field of vast extent in which there has been work of a more or less individual order, but not organized and comprehensive. Beyond the Institute of Fuel Economy Engineers, there is no established *ad hoc* fuel organization; and the Institute have not been particularly prominent, and technical information from them has not come our way. We are afraid their operations have been of a limited character. With regard to the Institution of Fuel Technology, it is not sufficient to say that a new organization is not required, unless it can be shown that all the interests involved have already, or would have, accommodation elsewhere. Will the establishment of a Fuel Section of the Society of Chemical Industry offer that accommodation? Mr. Woolcock's letter does not profess that it would. As a matter of fact, it states that

the Section will be open to any member of the Society on the payment of a registration fee of 5s. per annum. But Mr. Woolcock also says that, "in order to prevent overlapping, and to enable the subject to be dealt with in as comprehensive a manner as possible, it is hoped that co-operation with other institutions and in other ways may be arranged." This seems to indicate that the Fuel Section of the Society will be composed solely of members of the Society and therefore of chemists. But efficiency of fuel production and use is a subject which concerns a far larger range of professional men than chemists; and in this matter the chemists must not separate themselves in the actual work from the engineers and the men of industry who are chiefly and materially concerned in the vast problem. Co-operation with other bodies is not the same thing as united action. The chemists cannot do without the help of engineers and industrial magnates if their work is to produce far-reaching and maximum effect; and yet there appears to be no provision for their inclusion and direct co-operation and support, in the Fuel Section of the Society of Chemical Industry. On the other hand, the new Institution, which promises to have at its back manufacturing and financial influence, would be the poorer without the aid of the recognized scientific workers in fuel production and utilization whose names are associated with the Fuel Section of the Society of Chemical Industry, and several of whom are prominent in the scientific work of the gas industry. It is clear to us that each body of workers would have a strong pull in separate directions; pulling together, with a co-ordination and concentration of work, would have a more successful effect. Cannot a way be found for bringing this about? A round-table conference might have that result.

Electricity Bill.

An examination of the features of the Electricity Bill is made in our editorial columns to-day. There seems some doubt as to when the measure will come forward for second reading. The Prime Minister has intimated in the House of Commons that it will probably be taken on Monday or Tuesday of next week; but there is some fear among the members—particularly the Labour ones, who regard the Bill as a large step towards the ultimate realization of their nationalization objective—that the second reading will not be until after the Easter recess. A few days will show whether or not that fear is well-grounded. There is in the House, especially among the Industrial Group, a strong feeling that the Bill will have to be modified in several respects. Already amendments have been tabled by Mr. P. J. Hannon, Sir Philip Dawson, and Mr. Dennis Herbert. It is felt that the Electricity Commissioners are given a great deal too much power over the Central Board; and it is thought it would be better to transfer direct to the Minister of Transport certain of the powers which, as at present contemplated, would be vested in the Commissioners. Other people may have some doubt as to whether the Ministry of Transport, which has obviously been much controlled in this matter by the Electricity Commissioners, would still be sufficiently outside their influence to make the change effective for the purpose in view. The Government are obviously perturbed regarding the opposition to the second reading of the Bill. In this the gas industry is not taking any part. Its leaders will keep careful watch over its interests, and would only take action should they be directly assailed. That is so far as second reading is concerned. All that the industry desires is fair play and no favour. As to the fears of the Government, arrangements have been made for a meeting of Unionist members this week, which is to be addressed by experts. Will the Electricity Commissioners be represented among the experts?

200 B.Th.U. Gas.

Notice has appeared in the "London Gazette" that Nuneaton is to be supplied with 200 B.Th.U. per c.ft. gas—a reduction of 80 B.Th.U. An advertisement in the local paper states: "The standard price is at present roundly 1s. 6d. per therm, and the price to correspond with this thermal value is 4s. 3d. per 1000 c.ft. The price for the present will remain the same, 1s. 6d. per therm, but the altered price per 1000 c.ft. will be 3s." But the advertisement does not mention that the 1000 c.ft. will only contain 2 therms, as against 2·8 therms before. The advertisement proceeds: "The Directors of the Nuneaton Gas Company believe they are doing the right thing in the interests of their consumers, themselves, and the town of Nuneaton generally—and it might be added of the country—in taking advantage of the use of local coal. They look forward to the possibility of a considerable reduction in price at no very distant date. The fact is that, by reducing the calorific value, which within certain limits is arbitrary, something over 200 therms in gas (without coke) may be made from the gasification of one ton of coal, whereas the present practice only allows of about 75 therms to be made per ton of coal, together with coke. The whole Nuneaton district will benefit by the present proposal as the potentialities of cheap gas will be brought prominently to the front. A demonstration of improved methods of using gas will shortly be given at the gas-works of which notice will appear."

Company Promotions.

A shareholder of whom we have intimate knowledge states that his waste-paper basket has received at least half-a-dozen copies of the new edition of the Heathfield and Waldron Company's prospectus. This being so, other gas company shareholders may have been similarly pestered. He does not wish to communicate his name to the active spirits at 43, Cannon Street; but he would be greatly obliged if, by some means, they could co-ordinate their lists of shareholders so that his labour in tearing-up their prospectuses might be lightened somewhat. The latest prospectus he has had from the same quarter is a revival of that of the Wareham Electric Supply Company, Ltd. The Directors are now making what they term a new issue of electric light and power extension capital to the amount of £6741 in cumulative preference shares at par, which are to be free of income-tax up to 4s. in the pound, and will (if lucky) receive a dividend of 8 p.ct. The Baronet (whose name has done excellent duty in this and other 43, Cannon Street "enterprises") is the Chairman, and all the other names on the list are well known. There is Major Brigden, Capt. Hill, Wilfred Burton, Emerton Buik, the Solicitor Thompson, and the Auditor Turner.

Note These Points.

A paragraph appears in our "Legal Intelligence" to-day which is worth reading in connection with the foregoing note. It refers to the discontent of certain shareholders who put money into the Wareham Electric Supply Company and the Southern Counties Electric Light and Power Company. We understand that among applicants for participation in new issues of gas shares by well-established gas companies is a lady bearing a well-known name. Shortly after allotment, an application is made for a list of shareholders! This is perfectly legal; but for whom are the lists required, and to what use are they put? We will not trouble readers to reply to these questions.

The Averted Lock-Out.

There was an eleventh hour submission on the part of Messrs. Hoe & Co.'s men, who left their work two months ago in defiance of all trade union principles and instructions, in order to press forward two claims—one for an increase of wages, and the other to force the discharge of five men in the employ of the firm who were not trade unionists. The result was that the Engineering Employers' Federation had no alternative, all else having failed, than to give notice of a national lock-out so far as the members of the unions involved were concerned throughout the engineering trade. This notice would have expired last Thursday night; and it was only on that day that after repeated refusals the men employed by Messrs. Hoe were induced to promise to return to their work. Prior to that their resistance continued even after the five men had given an assurance that they would join a trade union; then the strikers stood-out for their discharge from the firm. All this has been despite the terms of the national agreement, which provides that such matters as these should be subject to the machinery of conciliation which was set-up with the express object of avoiding stoppages. The only satisfaction about the regrettable display of undiscipline is that it has pro-

vided a lesson for trade unionists generally, and may have a good effect in preventing similar disloyalty to the unions of which they are members. But trouble in the engineering industry is not yet over. There is the resolution of the engineering unions to press for wage increases; and a recent decision proposes that the claims shall be preferred on a local basis. The employers, on the other hand, adhere to the national practice, which has for some time been observed. Of course, the attitude of the employers is that, to attempt to enforce advances of wages at this time, must be resisted as a matter of industrial policy. Pressing for an advance of wages while conditions remain as at present must have a depressing influence on the endeavours to bring the industry back to a state of prosperity.

Eight-Hour Day.

Last week, at the Conference convened by Great Britain, the Delegates of France, Germany, Belgium, Italy, and this country came to an agreement on the problems arising out of the interpretation of the Eight-Hour Day Convention drawn up by the Washington Conference of 1919. The representatives, having reached a final agreement, affixed their signatures to the embodying document; and all promised to report to their Governments the conclusions arrived at. Of course in Great Britain the eight-hour day, or the forty-eight hour week, already obtains in most of the leading industries; while in coal mining a seven-hour day is the statutory one. There has been a little feeling on the part of some British industrialists that there are among their rivals in other countries those who would not faithfully carry out their undertaking; but it is thought that the agreement arrived at last week will do much to remove this feeling, and prevent an unfair and selfish interpretation of the convention. Naturally the longer hours that are worked in some countries are a handicap to us.

ELECTRICITY SUPPLY MEMORANDA.

Since the Government Electricity Supply Bill saw the light of day last Saturday week, it has naturally been the chief topic of discussion in the electricity industry; but the appearance of the measure has not by any means damped-down the antagonism to features of the scheme which was aroused by the Birmingham speech of the Prime Minister. If anything, the Bill has strengthened the hostility. There was promise that it would give far more details than had previously been possible by the various Cabinet Ministers who had publicly spoken on the subject; but they lifted the curtain with such excellent effect that there is very little in the Bill which has not already become common knowledge. As a matter of fact, comparing the Bill with the information given by the Prime Minister, and by the Chairman of the Electricity Commissioners (Sir John Snell), at the interview he had with technical journalists, the assumed secrecy that was being maintained over the details appears to have been a somewhat ludicrous proceeding. A summary of the Bill appeared in the "Journal" last week; and a comment is made upon it earlier in this week's issue. In view of this, we will not refer further to the matter in this note, excepting to say that, although the electricity industry is to have a Central Executive Board, with a retinue of paid officials and technical committees attached, in every part of the scheme for the reorganization of generation and transmission the Electricity Commissioners are to be dominant in power. The Bill elevates that body into a position of supremacy and control which exceeds anything that has ever been contemplated in connection with a trading industry in this country. The enormous capital expenditure also foreshadowed for this particular purpose, with all the attendant charges, will not be pleasing to the electricity industry. How in the cause of real progress all this forcing of pace is going to assist that industry is beyond the comprehension of many men of high rank in its professional service. Now that they have seen the Bill, some of them, we know, have hardened their hearts to greater extent against the Government proposals.

The Government Bill.

Rapid Boiling-Plates.

The conspicuously leisurely manner in which boiling-plates on electric cookers have hitherto performed their duties has led makers to concentrate on the production of higher power ones; and these they term "rapid boiling-plates," which, if examined relatively with other methods of doing the work, has no foundation in fact. These plates do not mean any improvement in thermal efficiency, but in time efficiency (for which there was large scope), though the makers appear to claim both. One example of the new hotplates is loaded to 1500 watts. It is claimed that this will bring 2 pints of water to boiling-point in twelve minutes from cold—"thus saving about 20 p.ct. of the current usually consumed for a similar operation." It does not necessarily follow that, because more current is sent into the element in a given time, the efficiency will be higher, as the quicker the heat is applied oftentimes the greater is the loss. In other words, there is no proportional relationship between heat input and loss, other conditions remaining the same. Twelve minutes is heavy going for 2 pints of water; and the efficiency is low. Two pints of water is equal to 2½ lbs. Assuming the water is put into the kettle at 50°, the increase to boiling-point is 162°, which, multiplied by 2½ lbs., is 405°. Twelve minutes is one-fifth of an hour; one-fifth of 1500 watts is 300 watts; and that is equal to 1023 B.Th.U. At 100 p.ct. efficiency, 405 B.Th.U. would suffice; but 1023 B.Th.U. are expended at 1500 watts per hour. Another element, with a maximum loading of 1800 watts, claims the ability to boil 3 pints of water in fourteen minutes. A third boiling-plate with a maximum loading of 1600 watts asserts its capacity to boil "as quickly as a modern gas-ring." If it cannot do better than the other two boiling-plates, it is telling an untruth.

The Architect and Electricity.

It is a good thing sometimes for business concerns to receive a little outside criticism, as it brings to attention weaknesses in methods which probably have escaped notice, and which have become more or less practices through continued application. For the Electrical Development Association's Conference in February, Mr. Blair Imrie, a well-known architect, was invited to address the electrical men who were present; and they found in him a very candid critic. He condemned many things which he has found electrical undertakings are prone to do; and he applauded the greater promptitude and facilities which gas undertakings offer. We are not, however, prepared to make any strong point of this, because we feel that Mr. Imrie has been unfortunate in his electrical experiences, and fortunate in those relating to gas. It is within our knowledge that there are electrical undertakings which are not sluggards; there are others which are. There are gas undertakings which are lethargic, and much behind the times, and do not quickly respond to the invitations of customers, or give good facilities for meeting their requirements. Mr. Imrie also stated that the architect is sometimes reproached with being too conservative with regard to electricity. In the main it is right he should be, inasmuch as he cannot make experiments when he is spending another man's money. He admitted that he is an "all-electric" enthusiast, but he is still waiting for the day when he can with a clear conscience omit the gas-main. We are hoping the gas industry will give good reason for Mr. Imrie having to wait a very long time.

Indictments.

Regarding electricity undertakings, Mr. Imrie said that, broadly speaking, they do nothing whatever in advance of, or to create, demand. No help or encouragement is given by them to the people who are willing to spend money in developing estates. He grumbled over the custom of charging what he considers exorbitant prices for laying service cables. On one estate for which his firm are the architects, he had a charge of £8 2s. 6d. for 25 ft. of service cable; in another case, he was asked for £20 for 70 ft. In the latter instance, the consumer threatened to become "all-gas," whereupon the electric company reduced their charge to £10. Another habit which annoys is the intimation that, although the consumer pays the cost of the service, the cable remains the property of the supply undertaking. Then he had a fling at certain companies whom he had found to be slow and unbusinesslike in connecting-up. One example he gave was a notice to a company on Nov. 7 last that a supply would be required by Dec. 1 at latest. By Dec. 10 the supply company had sent an account for charges, and a cheque was posted to them by return. But the builder was informed by the company that they could not connect until after Christmas! It was only when the builder told the company that he was threatened with damages for non-completion that connection was made the day after the owner had moved in. Mr. Imrie says that the gas main to the same house was put in with only seven days' notice. The next criticism had reference to the question of high rates for electrical energy; and he also made an appeal for tariffs which the architect could understand. In one case, the company were

asked to quote an alternative to the ordinary charge per unit; and this was the alternative:

> 1s. 3d. per annum on each £1 of rateable value, *plus* 4s. per annum on each 100 sq. ft. of floor space of living rooms, kitchen, and bedrooms only, *plus* 1s. 6d. per annum on each 20-watt lamp (or its equivalent) installed, except scullieries, bathrooms, passages, cellars, &c., up to quarter of total connection (calculated on wattage of lamps), less 10 p.ct., *plus* 2d. per unit used for all purposes up to 20 units per quarter per £1 of fixed annual charge, and 1½d. after that.

Small wonder that Mr. Imrie's client contemplates putting in a generating set for himself which will not burden him with such complications. The critic had a little censure also for electrical contractors; and it seems he has had occasion to form a poor opinion of the supervision which is given to the actual execution of work—particularly in respect of certain details. He charged the makers of fittings and appliances with the production of much indifferent material and goods. His chief complaint, however, against the makers of electric cookers and other appliances is that the architect hears so little about them. On the other hand, he receives so much literature regarding gas cookers, boilers, coppers, and apparatus of all kinds that he is forced to know all about them. In the discussion which followed the address, Mr. Imrie found that electrical contractors' and others' experience of architects is not of a uniform character, and that they are also guilty of somewhat curious practices—one example being the spending of large sums on gorgeous fittings, while accepting the lowest estimate for electric wiring.

An Advanced Joint Electricity Authority.

It ought to be placed on record in the "Memoranda" that the inaugural meeting of the West Midlands Joint Electricity Authority was held on March 10. The Electricity Commissioners were represented on the occasion by Sir Harry Haward; and, from a speech he made, it appears that this is the first Joint Authority whose plans for electrical development have been settled in advance by the cordial co-operation of the principal parties concerned. At this initial meeting, the Joint Authority were in a position to take immediate steps to carry out a technical scheme, including the transfer of the principal generating stations in the district, upon agreed terms. Sir Harry also complimented the new body upon being an excellent example of co-operation between local authority and company undertakings; and this particularly applies to the Midland Electrical Corporation, Ltd., who are the owners of the largest undertaking in the district. The area of the Joint Authority extends from Birmingham to the Welsh borders, with an average width of some 20 miles, and an area of 930 square miles. In the area the number of electricity units sold in 1925 averaged 138 per head of the population. Therefore the potentialities of electrical development there are said to be very great.

PERSONAL.

Mr. DAVID ROBERTSON has served the Dunoon Town Council well for many years as Gas Engineer and Manager; and it has now been agreed to retain his services, after May 15, as Consulting Gas Engineer, and to appoint a new Manager. Mr. D. Cameron (the Convener of the Gas Committee) told the Council that Mr. Robertson had started with the old Gas Company, and been transferred to the Gas Commissioners; and he had been "the best bargain of the lot." For more than a quarter-of-a-century Mr. Robertson had guided the undertaking with outstanding ability and devotion to his work. He had extended and improved the gas-works in many directions. Now, at the time of his retirement, his relations with the public, with his brother officials, and with the Council were more cordial, more harmonious, more mutually appreciated than perhaps was the case at any other period of his career. They hoped he would be long spared to remain in a community he had served so faithfully. Other members spoke in equally gratifying terms of Mr. Robertson's services.

OBITUARY.

The death occurred on the 14th inst., at the advanced age of 96 years, of Mr. GEORGE BRAMBLES, for over forty years Chairman and Managing Director of the Bridlington Gas Company. He joined the Company half-a-century ago, when the financial position was precarious; and it is generally acknowledged that he was mainly responsible for placing the undertaking in a sound position. Mr. Brambles was at one time a member of the Bridlington Town Council.

Forthcoming "B.C.G.A." District Conferences.

In order that timely note may be made of the respective dates, readers are advised that arrangements are in hand for the following District Conferences of the British Commercial Gas Association. Details will be announced later.

Scotland.—Perth, April 30.
Manchester.—Buxton, May 14.
Cheshire and North Wales.—Wallasey, May 18.
Midlands.—Smethwick (during the Smoke Abatement Exhibition at Birmingham), Sept. 9.

FORTHCOMING ENGAGEMENTS.

[*Secretaries of Gas and Kindred Organizations are asked to assist in making this diary of events as complete and useful as possible by sending the earliest intimation of all meetings.*]

March 26.—LONDON AND SOUTHERN DISTRICT JUNIOR GAS ASSOCIATION.—Meeting at Westminster Technical Institute.
March 27.—SCOTTISH JUNIOR GAS ASSOCIATION (WESTERN DISTRICT).—Visit to Falkirk.
March 27.—MANCHESTER AND DISTRICT JUNIOR GAS ASSOCIATION.—Annual meeting and dinner, at Manchester.
March 30.—ILLUMINATING ENGINEERING SOCIETY.—Meeting.
April 2.—NORTH BRITISH ASSOCIATION OF GAS MANAGERS.—Annual spring meeting at Motherwell.
April 13.—NATIONAL GAS COUNCIL.—Meeting.
April 13.—FEDERATION OF GAS EMPLOYERS.—Meeting.
April 17.—MIDLAND JUNIOR GAS ASSOCIATION.—Visit to the Old Kent Road Works of the South Metropolitan Gas Company.
April 30.—"B.C.G.A.," SCOTTISH CONFERENCE.—Perth.
May 5.—SOCIETY OF BRITISH GAS INDUSTRIES.—Annual general meeting at the Hotel Cecil, under the presidency of the Rt. Hon. Sir Alfred Mond, Bart., M.P.
May 6.—EASTERN COUNTIES GAS MANAGERS' ASSOCIATION.—Spring meeting at Ipswich.
May 6.—MIDLAND ASSOCIATION OF GAS ENGINEERS AND MANAGERS.—Spring general meeting at Dudley.
May 14.—"B.C.G.A.," MANCHESTER DISTRICT CONFERENCE.—Buxton.
May 18.—"B.C.G.A.," CHESHIRE AND NORTH WALES DISTRICT CONFERENCE.—Wallasey.
June 1.—NATIONAL GAS COUNCIL.—Annual General Meeting.
Sept. 9.—"B.C.G.A.," MIDLANDS DISTRICT CONFERENCE.—Smethwick.

INSTITUTION OF GAS ENGINEERS.

April 13.—Advisory Committee on Education.
April 14.—Emergency Committee, Finance Committee, Council.
May 11.—Advisory Committee on Education.
May 12.—Benevolent Fund, Finance Committee, Emergency Committee.
June 7.—Council.
June 8-10.—Annual Meeting.
June 11.—Visit to Hastings.

Producer Gas Fired Boiler.

The "Engineer" has published figures taken from tests which have recently been conducted on behalf of Mr. W. M. Carr, Engineer and Manager of the Stretford Gas-Works, on a steam boiler with a self-contained gas producer furnace constructed for experimental purposes in a works at Trafford Park by Wollaston Gas Producers (Manchester), Ltd., of Bank of England Chambers, Manchester. The boiler is of the vertical Cochran type; while the furnace is a simple gas producer with a basket grate and a water bosh for the removal of ashes. The refractory lining is formed with spiral air channels round the periphery for pre-heating the secondary air. The crown is in the form of an inverted cone with a central orifice through which the fuel is fired by way of the normal fire door; and the working level of the fuel is maintained well up in the cone, in order to keep the central orifice sealed. The furnace crown is perforated with a number of burner orifices for the escape of the gas made in the producer. These orifices are connected with secondary air ducts, giving, when in operation, a bunsen burner effect. Forced draught is produced by means of a fan; the relative quantities of air being correctly proportioned by means of valves or dampers. While practically the whole of the furnace and producer is composed of firebrick, the greatest heat does not come into contact with this refractory material. Using coke breeze as fuel, the figures referred to showed an all-round efficiency of 66·3 p.ct. with fire tubes open, and 73·8 p.ct. with retarders in the fire tubes; and a producer efficiency of 87·8 p.ct. in the former case, and 88 p.ct. in the latter.

Manchester and District Junior Gas Association.—The Association will hold their annual meeting and dinner at Manchester, on Saturday next, March 27. A paper will be read by Mr. F. Small, of Liverpool, on "Tar Distillation."

EXAMINATION AND EVALUATION OF COALS FOR CARBONIZING PURPOSES.

By Geoffrey Weyman, D.Sc.

(*Concluded from p.* 679.)

Evaluation.

A basis of evaluation is suggested in "Modern Gas-Works Chemistry." Experience has shown that the rather cautious statement there made can be considerably modified, and that schemes can be devised which show the value of a coal in figures of substantial accuracy. It is well worth while regularly to summate the value of a coal in such a way that it ensures that the various qualities are appreciated in due proportion. It has been suggested—and the plan would doubtless be advantageous—that coal should be bought on a guaranteed ash content or calorific value. But in this there is a very real danger. Those making contracts on such a basis would lose sight of the fact that the value of a coal for gas making does not depend primarily on either of these qualities. There are plenty of coals with low ash and high calorific value which are practically useless for modern gas-works practice. This shows the value of, and the necessity for, a real evaluation scheme which takes into consideration the qualities on which commercial success really depends. An evaluation scheme must take account of the commercial state of affairs at the time. It must therefore be based on existing market prices, current working costs, and local working conditions. It is of no use saying that a coal is worth so much if carbonized in some plant which is not available, or under conditions which do not actually exist. The value must reflect the actual profit to be obtained in practice. Since market prices of products and working costs vary from time to time and according to locality, the scheme must be readily adjustable. It also follows that coal testing on which a valuation depends must be carried out by each individual concern. Any method of testing and evaluation put forward for general use must therefore be capable of considerable flexibility.

The basis of evaluation should be the net profit commercially obtainable from the coal. In the case of the carbonizing industries, as in other industries in which a complex process is carried out—that is, when several products are obtained from the same raw material in one process—it is not possible to ascertain the net profit for each product, because the cost of the raw material and the process costs cannot be correctly apportioned. This means that the value of a coal cannot be obtained by simply multiplying the various yields of products by the net profit in each case. The operation of the sliding-scale in regulating the relation of net profit and price is applied to the gaseous therm, but indirectly affects all the products. The net total profit of a gas concern may be 5 p.ct. If the coke and other products really return more than 5 p.ct., the gaseous therm must return less than 5 p.ct., and vice-versa. The object of the works is to increase the revenue from the other products, in order to reduce the price (and net profit) of gas. It must always be remembered that gas sales are independent of the sales of other products. To take an example, the recovery of benzole does not affect the consumption or the sale of gas. It simply means that more gaseous therms must be made which are recovered as benzole. The coal to be carbonized is therefore increased, and the business of the works is extended. So long as the cost of manufacture (other than cost of coal and of carbonizing) does not exceed the selling price of the product, whether crude benzole or motor spirit, but a surplus is left towards the cost of coal and carbonization, then the recovery is evidently contributing to the dream of making the "residual" products balance the cost of gas manufacture, leaving the gas free from all but distribution charges. On occasion, the net revenue from the so-called "residuals" has outbalanced the total cost of coal, and the existence of such a possibility makes it imperative to secure a true relative value for the products obtained from it. In order to provide a basis for evaluation, the assumption is made that the net profit from each product is proportional to the market price *less* costs other than that of the coal and general carbonizing costs which are common to all. Thus the market price of the gaseous therm is taken, *less* distribution and overhead charges of such department; the coke and breeze prices are reduced by the handling costs, the sulphate by the usual manufacturing costs, and the tar by handling costs. If the tar is worked-up and sold in different forms, the total revenue from these is taken, *less* working costs, naturally giving an increased value per gallon of tar; and so with benzole, when this is recovered. Typical examples of such basic prices are given in column 1, Table III.

Gross Valuation.

In order that the evaluation shall have reference to commercially obtainable coals, a selected coal (the best coal obtainable in sufficient quantity) is taken as a standard, and might yield the results given in column 2, Table III. The total value is given in column 3, and this is expressed as a percentage in column 4. Thus the yields of products in relation to commercial value are: Gas: coke: breeze: sulphate: tar = 58·26: 33·41: 1·96: 3·00: 3·63. Supposing the standard coal has a market price at the moment of 20s., the return on this price will be in proportion to the percentages stated in column 4. Any other coal, to bring in the same return, must be purchased at a higher or lower price according to the sum of the actual yields multiplied by the unit value, column 5. The sum then gives a gross valuation in terms of a percentage of the market price of the standard coal.

Table III.—*Evaluation on Coal Test Results.*

Column . .	1.	2.	3.	4.	5.
——	Basic Price. Pence.	Yield per Ton.	Total Value. Pence.	Total Value. P.Ct.	Value per Unit. P.Ct.
Gaseous therms .	5	70·2	351	58·26	0·83
Coke, cwt. . . .	16·5	12·24	202	33·41	2·73
Breeze, cwt. . .	5·5	2·16	11·9	1·96	0·91
Sulphate, lbs. . .	0·7	25·0	17·5	3·00	0·12
Tar, gallons . .	2 0	11·0	22 0	3 63	0·33
Total . . .	..	..	604 4	100·26	..

Quality Factor.

It is assumed that all gaseous therms are of equal value. This is not strictly correct, as a therm in the form of 490 B.Th.U. is not of much use to a gas concern having a declared calorific value of 500 B.Th.U. However, if a coal in the coal-testing plant produces such low quality gas, the valuation for several reasons will be so low that it would hardly be acceptable.

The quality of the coke is partly recognized in its division into coke and breeze. The ash content is corrected for on the coal, as will be seen later. Perhaps the future will show a necessity for taking combustibility into account.

There does not appear to be any need to introduce a quality factor for ammonia, provided a limit is placed on the moisture content of a coal, to prevent undue dilution of the ammonia liquor. The tars produced do not appear to vary sufficiently to warrant the use of a quality factor, unless, perhaps, when the tar is worked-up for a very large range of refined products on a tar works.

Net Valuation.

The summated value is a gross valuation based on the yields and quality of the products. It does not take account of the amount of time and labour involved in the treatment of a coal, nor in the special trouble caused by high ash and moisture. The gross valuation is therefore "corrected" by deductions for any excess in these respects over the standard coal. Should a coal give less moisture or ash, or a higher carbonizing rate, then a corresponding addition is made.

Moisture.

A reasonable standard content is 2 p.ct.; and as the depreciation within usual limits is proportional, a deduction or addition of 1 p.ct. for each variation up or down is made from the gross valuation.

Ash.

It might be argued that, as the ash, within limits, does not appear to affect adversely the carbonizing process or yield of products, but is of vital consequence in respect to the quality of the coke, it would be only logical to deduct any penalty from the coke value; and this could be done. But it must be remembered that the ash is brought in primarily as coal, and that the process of carbonization is indirectly dependent on the coke and breeze (and therefore influenced by the ash) which are invariably used to heat the retorts and raise steam. The depreciation of coke by reason of its ash content has such far-reaching effects that it is thought best to emphasize its importance by attaching any penalty directly to the coal.

It is a matter of some difficulty to attach a definite value to the amount of depreciation which takes place when the ash in coal is (say) 9 p.ct. instead of a standard 8 p.ct.; but there is a consensus of opinion that it is at least twice the amount of such difference, or 2 p.ct. So far as coke and breeze used on the works are concerned, not only is the thermal value of the coke yielded per ton lessened proportionately, but the combustion of the remaining thermal value is not so efficient—that is to say, so much less is actually of use, and more is wasted. There is also the removal and disposal of so much more refuse. Difficulties arise in regulation of the heats of settings which cause serious loss, as the coal is badly carbonized; and boilers refuse to provide sufficient steam, and perhaps capital has to be spent in enlarging the steam capacity. All these difficulties find their parallel in the experience of those who purchase the coke left for sale. It is possible that the introduction of coke-oven coke on to the domestic market might not have succeeded if the ash content had been not only less in quality, but more invisible, as in other respects it is a less suitable fuel.

The disadvantage of the ash rises out of all proportion with increase of the total ash, until at some point it can be said that the coke has no value at all; at what precise point this occurs is hardly ascertainable. It can only be suggested that

for a variation up or down from a fixed standard ash content, a deduction or addition of 2 p.ct. should be made for each 1 p.ct. variation.

RATE OF CARBONIZATION.

If the rate of gas evolution is plotted against the time, the curve takes the form shown in fig. 4. The rate increases

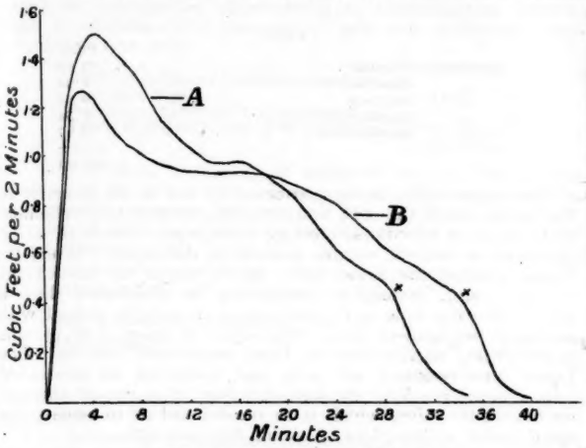


Fig. 4.—Rate of Gas Evolution.

A—Curve for quickly carbonizing coal.
B— ,, ,, slowly ,, ,,

rapidly during the first minute or so and then gradually falls. This evolution of gas is chiefly due to gas evolved as each layer of coal comes into the carbonizing zone, owing to the gradual penetration of heat into the interior of the mass, and to a smaller extent to the gas evolved from the already formed coke. The criterion of the rate of carbonization is the rate of heat penetration, as is indicated by the chief portion of the gas evolved; and the sudden drop in the curve which occurs between the 20 and 30 minutes from the start is an indication that the heat has penetrated to the centre. The average amount of gas evolved per ten minutes during the period from start to this sudden drop in the gas evolution is taken as the relative rate of heat penetration or carbonization. As an approximation, the average rate for ten minutes over a period of the first 20 minutes may be taken. A standard coal might give a figure of 4·3. For the purpose of valuation this is made to represent a figure of 50, and a deduction or addition is made as a percentage of the gross valuation according to whether the test coal gives a result in proportion above or below 50. The reason for taking 50 as the basis for a percentage correction is as follows. When a standard coal is carbonized, it is assumed that 50 p.ct. of the cost of the products is due to the raw material coal. If the time of carbonization is increased, the costs other than that of the raw material (50 p.ct. of the total) go up practically in proportion to the extra time. Therefore the rate of carbonization may be said to affect proportionately half the value of the products. Hence the standard rate is made to represent 50 instead of 100

The correction for the rate of carbonization obtained in this way lies between + 5 and −10 p.ct. of the gross valuation. The actual percentage rate of carbonization therefore varies twice this extent, or a total of 30 p.ct. In practice the variation has been experienced up to 30 p.ct., and 25 p.ct. is quite commonly experienced when a variety of coals is carbonized. The penalty cannot therefore be regarded as unduly heavy. If horizontal retort practice is considered with its fixed time of charging, it is obvious that a coal which carbonizes slowly will be under-carbonized when pushed from the retort. If this practice is followed on the coal-testing plant—that is, the test stopped at a fixed time—the loss in the evaluation would be heavier than it is when calculated as above, owing to the serious diminution of the gaseous therm value. When used in continuous vertical retorts, the coal can be to some extent given special treatment to extract a reasonable therm yield; and this synchronizes very well with the method suggested. To exemplify the method of testing and evaluation which has been described, a few typical results are given in Table IV.

The evaluation is arrived at as follows for coal A, taking the values per unit per cent. shown in Table III.:

Gas, therms	74·36 × 0·83 = 61 72
Coke, cwt.	12·00 × 2·73 = 32·76
Breeze, cwt.	2 50 × 0·91 = 2·27
Sulphate, lbs.	26 00 × 0·12 = 3·12
Tar, gallons	10·00 × 0·33 = 3·30
Gross valuation	103·17
Corrections—	
Moisture	2·0 − 0·93 = 1·07
Ash	2 (8·0 − 7·0) = 2·00
Carbonizing rate	51 − 50 = 1·00 4·07
Net valuation	107·24

CONSIDERATION OF RESULTS.

The coal A can be considered a really good gas coal. B is a quick-carbonizing coal giving a rather thin gas and only moderate coke. This would be a useful coal for blending with C or D, which give good coke, but are slow in carbonizing. D is a small coal yielding an excellent quantity of tar. E is an easily-carbonized coal, but suffers from a heavy ash and poor coke. F is a washed small coal. The heavy moisture is hardly counterbalanced by low ash, and, owing to its being small and wet, the carbonizing rate is low. The coke and tar yields are good. A reduction in moisture and elimination of dust would make this a very valuable coal. G is a cannel which suffers from the heavy ash content and poor coke, but gives an exceptional therm and tar yield. H is an example of a poor outcrop coal quite unsuitable for gas-works use. I shows the effect of a very heavy ash on an otherwise excellent coal. J and K show the effect of dry cleaning. Both have been reduced in size for the process, but K has lost the fine dust, which apparently largely consisted of fusain, which is present in J, as well as a good deal of ash as a result of the cleaning. Hence the carbonizing rate is lower, the coke greater in quantity and of harder quality, while the therm yield is not quite so good. The net result is an increase of 3·7 p.ct. in the net valuation, representing 9d. per ton. It should be pointed out that J is already partially cleaned, and the difference due to cleaning would, of course, be very much larger if the comparison had been made of the run-of-mine coal. If the coal I had been cleaned, for example, the difference would have been at least 20 p.ct., or (say) 4s. per ton.

As an example of consistency in coal supply, it may be mentioned that of twenty different consignments from one colliery tested individually, the maximum variation was 2 p.ct. on the ash, 2 therms per ton on the gas yield, and 2 p.ct. on the net valuation. This, however, is very rare; and the evaluation of coal from a single colliery may vary as much as 20 p.ct. This in terms of a standard coal at 20s. per ton means as much as 4s. per ton difference in the value. In view of the fact that as many as seven or eight seams are worked at some collieries of different types ranging from cannel to coking coals, this is not to be wondered at. Uniformity of coal supply in the retort house is perhaps of more value than actual quality; and it would appear that the value of coal generally could be considerably enhanced if greater uniformity could be secured.

It has been already pointed out that the method of evaluation developed above must be adapted in each case, particularly as the standard of coal available from the various fields is so different; and it must not be thought that the details and values given have been or could be applied without such modification.

In conclusion it may be pointed out that the use of a coal testing plant such as that described is not confined to routine testing. Information of the greatest value can be obtained by experimental work in carbonizing conditions and in the effect of blending various types of coal. Its educational value also is not to be despised.

TABLE IV.

Coal.	Moisture P.Ct.	Volatile Matter. P.Ct.	Ash. P.Ct.	Yield of Gas. C.Ft. per Ton.	Calorific Value of Gas. B.Th.U. (Gross).	Gas. Therms per Ton.	Coke. Cwt. per Ton.	Breeze. Cwt. per Ton.	Sulphate of Ammonia. Lbs. per Ton.	Tar. Gallons per Ton.	Carbonizing Rate	Gross Value.	Net Value.	Value at 20s. per Ton for Standard Coal.
Standard	2·00	31·00	8·0	13,000	540	70·2	12·24	2·16	25·0	11 0	50	100·26	100·26	20·05
A	0·93	32·98	7·0	13,000	572	74·36	12 00	2·50	26·0	10 0	51	103·17	107·24	21·44
B	1·20	36·88	8·17	13,000	529	68·77	11·52	2·88	28·0	11·8	53	98·40	101·86	20·37
C	1·60	30 40	7·90	13,000	537	69·81	12·72	1·74	25·0	10·8	44	100·81	95·41	19·08
D	2·04	32·01	8·05	13,000	555	72·15	11·90	2·10	28·0	13·7	43	102·16	95·02	19·00
E	1·47	34·40	10·67	13,000	543	70·59	10·88	2·72	27·0	11·0	47	97·64	89·83	17·97
F	12·75	31·33	4·36	13,000	540	70·20	11·48	0·72	29·0	12·5	43	97·86	87·39	17·48
G	0·90	39·95	12·35	13,000	642	83·46	10 88	1·92	25·0	13·2	53	108·08	103·48	20·69
H	3·18	34·93	10·16	13,000	485	63·05	10·03	3·17	21·0	8·8	51	88·02	83·52	16·70
I	1·29	28·76	15·62	13,000	553	71·89	11·93	2·27	25·0	9·0	46	100·27	81·74	16·35
J	0·93	31·52	9·10	13,000	563	73·19	12·21	2·09	25·0	12·0	44	102·94	95·81	19·16
K	1·11	29·04	6·40	13,000	557	72·41	12·61	1·85	25·0	12·5	42	103·37	99·46	19·89

Evaluation from results of coal testing. The retort temperature was 1050° C. When ammonia was not actually determined, the standard yield of sulphate is given.

WALES AND MONMOUTHSHIRE JUNIOR GAS ASSOCIATION.

[At this meeting Mr. C. Bateman, of Bath, read a paper dealing with the manufacture of sulphate of ammonia—a resumé of a thesis for which he was awarded the Diploma of the Institution of Gas Engineers. Particular attention is paid to the neutralization of the salt. Experiment showed the suitability of powdered ammonium carbonate for this purpose, from the points of view of both labour-saving and efficiency; and after a period of one month as an experiment, the method was adopted permanently.]

On Saturday, March 13, the members of the Wales and Monmouthshire Junior Gas Association visited the works of the South Wales Power Distribution Company, at Upper Boat. Mr. W. A. Chamen, the General Manager of the Company, extended a very cordial welcome to the party; and Mr. R. Roper and his assistants, who conducted the visitors round the splendidly equipped station, gave the fullest information regarding the plant installed.

The members were subsequently entertained at tea, following which, on the proposition of Mr. J. Wood (Pentre, President of the Association), seconded by Mr. C. Bateman (Bath, Senior Vice-President), and supported by Mr. D. Muir (Pontypridd), a vote of thanks was accorded to Mr. Chamen, Mr. Roper, and his assistants for the facilities afforded and for the courtesy and hospitality extended.

A meeting was then held at the Municipal Chambers, Pontypridd, when Mr. Wood took the chair.

The Secretary announced that Mr. D. M. John, Aberdare, had resigned the position of Senior Vice-President of the Association. The Council had elected Mr. C. Bateman to that office, and Mr. A. H. Shepherd, of Swansea, their Treasurer, to the office of Junior Vice-President.

Mr. A. E. Martin (Merthyr) moved a resolution extending to Mr. Muir and the Pontypridd Urban District Council the thanks of the Association.

The vote was seconded by Mr. Collins (Swansea), and supported by Mr. T. V. Blake (Cardiff).

NEUTRALIZATION OF SULPHATE OF AMMONIA AND SUPPLEMENTARY NOTES ON MANUFACTURE.

By C. Bateman, of Bath.

Sulphate of ammonia is one of the chief bye-products obtained from the destructive distillation of coal. Its formation primarily depends upon the nitrogen content of the coal, which, though very small, is of great importance. It varies from 1 p.ct. to 3 p.ct. (by weight) only, being least in anthracite. The average gas-making coal in this country contains approximately 1·5 p.ct. (by weight).

In the process of carbonization, the splitting-up or distribution of the total nitrogen may be recorded as follows:

15 p.ct.	evolved as ammonia.
5 ,,	forming hydrocyanic acid, pyridine, and other organic compounds.
30 ,,	remains in the gas.
50 ,,	retained in the coke.

The following analysis shows the relation of the nitrogen content in other constituents:

Carbon	80 p.ct.
Hydrogen	5·5 ,,
Oxygen	8·8 ,,
Nitrogen	1·5 ,,
Sulphur	0·8 ,,
Ash	3·4 ,,
Volatile matter	30 to 35 ,,
Calorific power	14,400 B.Th.U. per lb.

The ammonia recovered represents approximately 12 p.ct. of the original calorific value of the coal. If all the nitrogen could be converted into sulphate of ammonia, a coal with 2 p.ct. nitrogen would yield 215 lbs. of sulphate of ammonia per ton of coal. In practice 27 to 28 lbs. per ton is usual, but the conversion of nitrogen to ammonia is increased considerably by the aid of steam, as in various types of vertical retort installations.

One of the first steps in gas purification is the recovery or extraction of the ammonia from the gas, and this is done primarily by condensation. Further extraction is greatly simplified on account of the great affinity between ammonia and water, which is capable of absorbing approximately 780 times its own volume of ammonia gas. This agent is usually employed in combination with some mechanical means of "scrubbing" the gas.

The liquor obtained, which is a solution of ammonium compounds in a volatile and fixed state, is now stored, preferably in an overhead tank, and supplied by gravity to the chemical works for treatment and conversion to sulphate of ammonia; the principle being, of course, to distil ammonia gas into sulphuric acid.

The following is a typical liquor analysis, showing the usual combination of ammonia and the volatile and fixed content:

Volatile.	P.Ct.
Ammonium sulphide	4·91
,, carbonate	63·55

Fixed.	P.Ct.
Ammonium chloride	23·69
,, thiocyanate	2·92
,, sulphate	0·32
,, thiosulphate	4·54
,, ferrocyanide	0·07
	100·00

The liquor, after being preheated by hot waste gases from the plant, enters the still, and flows downwards from chamber to chamber at overflows, meeting an upward current of steam sufficient to free the volatile content of the liquor. When the liquor reaches the lower half, which might be termed the "fixed" still, instead of continuing its downward flow it passes into the lime still, where it is thoroughly mixed with excess of hot milk of lime. The object of using milk of lime is completely to volatilize the fixed ammonium content. The liquor then re-enters the still, and continues its downward course until, reaching the last chamber, it is run-off through an automatic valve, which is so constructed as to release the spent liquor without loss of steam and ammonia.

The ammonia gases, leaving the still, pass along a cast-iron pipe into the saturator, which derives its name from the fact that here the sulphuric acid is saturated with ammonia gas. The usual saturator is the closed type.

The ammonia or "cracker" pipe divides into two as it enters the saturator, each section running to the bottom and branching-out into a semi-circular path, making practically a complete circuit of the base. Each branch is drilled with a series of small holes, which ensure an efficient distribution of the ammonia gas throughout the saturator.

The gas, on coming into contact with the sulphuric acid, combines with it to form sulphate of ammonia, which collects in a suitably constructed well in the base of the saturator. It is then ejected, together with mother liquor, on to the draining table, by means of a steam ejector. The salt here may contain anything up to 3 p.ct. (by weight) of acid. The mother liquor is then drained off, and the salt pushed from the draining table into a perforated centrifugal whizzer, which is revolved at 600 r.p.m. The centrifugal force set up is sufficient to remove excess moisture and mother liquor.

The salt would then have a specification as follows:

	P.Ct. by Weight.
Ammonia	24·75 to 25·00
Moisture	up to 2·0
Free acid	0·3

Up to a few years ago, the production of a neutral dried variety of sulphate of ammonia was confined to only a few plants, but a steadily increasing demand for this salt has made its manufacture a thing of necessity and import.

There are various methods of neutralization in present-day use, and the following have been experimented on for the purpose of this thesis: Neutralization with water, ammonia solution, caustic soda solution, soda ash solution, caustic soda, soda ash, ammonia gas, and ammonium carbonate.

When studying the best means of neutralizing with a solution, it was decided that neutralization could be better effected in the centrifugal drier; and this condition was observed in all cases of neutralization by solutions. The methods are taken in sequence.

Water was first experimented with as the neutralizing medium, but a series of experiments proved this method to be unsatisfactory in principle and use. One great disadvantage was the large amount of salt lost during washing. A loss of 25 p.ct. by weight was recorded—so great as to make this method impracticable. Another point, the salt was still unneutralized. The writer's own opinion is that the acid salt (ammonium bisulphate) is formed in manufacture, and it is both theoretically and practically impossible to wash out this acid radical by a water medium only. The water washing did reduce the percentage of free acid; and on this account, in all methods of neutralization, the salt is first washed with a certain amount of hot water—the objects being to wash out as much of the excess acid as possible, and to reduce the amount of neutralizing agent required, yet at the same time not using a sufficient quantity to affect materially the loss of salt. Hot water washing removes the free acid held in suspension on the external surface of the crystals, but not the acid radical contained within the crystal. On this account, only partial neutralization is obtained with hot water.

When neutralizing with ammonium hydrate, four gallons of 0·5 p.ct. solution were used. The ammonia was made up by subjecting a mixture of sulphate of ammonia and lime to steam distillation, and collecting the products of distillation in a small storage tank. This concentrated ammonia was then

run into a large mixing tank, made up to 0·5 p.ct. strength, and from this tank drawn periodically as required into a pot holding exactly four gallons. This neutralizing solution was forced from the pot by air pressure (2 lbs. per sq.in.), and distributed over the salt in the slowly revolving centrifugal.

For a compact unity of style and a better comparison and consideration of the points of each method, the writer has based all calculations appertaining to neutralization factors upon a predetermined amount of salt and maximum percentage of free acid:

Weight of sulphate of ammonia contained in one centrifugal . . . . . = 3 cwt.
Percentage of free acid before neutralizing . = 0·3
Weight of sulphuric acid to be neutralized . = 0·009 cwt.
= 1·008 lbs.

As will be seen, 1·008 lbs. of sulphuric acid is the known amount to be dealt with. This free acid figure is slightly in excess of the usual amount; but the maximum percentage ever found after washing with hot water was 0·3 p.ct., and, on this account, this figure was taken. Therefore the quantity of ammonia required to neutralize each fugal of salt is the amount which will neutralize 1·008 lbs. of sulphuric acid:

$$\text{Weight of ammonia to neutralize 1·008 lbs. of sulphuric acid} = \frac{34}{98} \times 1{\cdot}008 \text{ lbs.} = 0{\cdot}35 \text{ lb.}$$

which is equivalent to approximately 1·4 lbs. of sulphate of ammonia.

The following table gives the average results of analysis of samples of salt obtained at various points during manufacture and neutralization:

No.	Sample.	P.Ct. Ammonia.	P.Ct. Free Acid.	P.Ct. Nitrogen.	P.Ct. Moisture.
1.	*Ex* saturator on table.	15·00	3·00*	12·33	..
2.	*Ex* table in fugal . .	19·30	1·93*	15·89	..
3.	After first whizzing .	23·27	0·28	19·16	2·00
4.	After washing with hot water	24·16	0·19	19 89	2·30
5.	After neutralizing . .	25·63	0·00	21·11	0·63
6.	Finished dried salt .	25·62	0·00	21·10	0·13

* These acid figures vary with the amount of mother liquor ejected with the salt.

Working Conditions.

Acid bath . . . . . 56° Tw.
Temperature . . . . . 212°–216° Fahr.
Ammonia bath. . . . . 0·57 p.ct. (4 gallons used.)

1. The sample was taken immediately after the salt was ejected from the saturator on to the draining table.
2. In this case, the sample was taken as the salt was being removed from the draining table to the centrifugal whizzer.
3. Sample taken after the first period of whizzing for the removal of moisture.
4. Sample taken after washing with two gallons of hot water.
5. Sample taken after neutralizing with a weak ammonia solution. (Four gallons of approximately 0·5 p.ct. strength.)
6. The sample of the final salt prior to sale.

Ammonia solution has been extensively used as a neutralizing agent with very fair results, but it has two very pronounced disadvantages. The first is caused by the corrosive action of ammonia on the copper baskets, linings, and spindles, which is due to the formation of a double ammonium salt, ammonio-cupric sulphate, $CuSO_4$, $(NH_3)_4$, H_2O. This corrosion did not appear antagonistic to best working conditions, but the cost sheets proved the greatest disadvantage to any lengthy application of the method. When it was considered that the average life of a copper gauze lining was three weeks to one month, a basket four to six months, and a spindle twelve to eighteen months, it may well be seen that the expenses of these renewals made this method prohibitive. During the period of neutralizing with ammonia solution, a basket of rustless steel was experimented with, but with still less satisfactory results.

The second disadvantage is the formation of rock salt, which probably is due to running back the ammonia solution into the saturator. Such a practice has two effects on the contents of the saturator—the first, of causing a sudden drop in temperature; the second, of causing local alkalinity or super-saturation. The combination of these two effects, or defects, undoubtedly produces deposits of rock salt, which builds-up with the period of working the plant.

The average period of working the saturator under these conditions was two to three weeks, when the plant had to be shut-down, to remove this rock salt.

With a view to further ascertaining the formation of the rock salt, an analysis was carried out, which is as follows:

	P.Ct.
Moisture . . . . . =	0·202
Ammonium sulphate . . . =	95·940 (= 24·99 p.ct. ammonia)
Free acid . . . . . =	0·117
Insoluble matter . . . . =	1 671
	98·930
Loss and unestimated . . . =	1·070
	100·000

Analysis of Insoluble Residue.

	P.Ct.
Copper calculated as CuO . . =	72 68
Iron ,, ,, Fe_2O_3 . =	3·28
Lead ,, ,, PbO . =	8 83
Calcium ,, ,, CaO . =	2·64
Tarry matter and sulphur . . =	10·38
	97·81
Loss and unestimated . . . . =	2·19
	100 00

Traces of ferrocyanide, sulphate, sulphocyanide, and arsenic were also present. The high percentage of copper in the residue goes to prove to some extent that the formation of rock salt was due to local alkalinity. The presence of tarry matter indicates that the light particles of tar floating on the liquor were carried forward suspended in the steam, from the still to the saturator.

The method of neutralization by means of a caustic soda solution is carried out by spraying the salt with a requisite amount of caustic soda in solution; the amount being arrived at as follows:

$$\text{Weight of caustic soda to neutralize 1·008 lbs. of sulphuric acid} = \frac{80}{98} \times 1{\cdot}008 = 0{\cdot}823 \text{ lbs.}$$

An amount of caustic soda slightly in excess of this figure has to be used to ensure complete neutralization; and this excess, on account of its strong basic action, tends to the evolution of ammonia from the salt. This reaction, together with the additional weight of sodium salts formed as a product of neutralization, naturally reduces the ammonium content of the salt, which is the great drawback to this method.

The following are average results obtained over a considerable period while neutralizing in the above manner:

	P Ct.
Free acid after washing and before neutralizing . .	0·21
Free acid after neutralizing	*Nil*
Moisture	0·15
Ammonia.	24 80
Nitrogen	20·42

Neutralizing with a soda ash solution (Na_2CO_3) was done in identically the same manner as in the caustic soda method, and has the same drawbacks, though the evolution of ammonia is perhaps not so great.

The amount required was calculated in the usual way:

$$\text{Weight of soda ash to neutralize 1·008 lbs. of sulphuric acid} = \frac{106}{98} \times 1{\cdot}008 = 1{\cdot}09 \text{ lb.}$$

Both caustic soda and soda ash were experimented with as neutralizing agents, in solid form. Caustic soda was found unpractical, owing to the difficulties in handling; and soda ash had similar disadvantages as when used in a solution—the chief one being the reduction in the ammonium content. Dry soda ash is being used considerably for neutralizing; the operation taking place in combination with a final drier.

Gaseous ammonia was also experimented with, but only on a small scale, as the introduction of this method would have necessitated a large expenditure on special plant. This plant would consist of a rotary drier, inside which is a series of arms or blades which pick up the salt and turn it as it passes along the cylindrical casing. Furnace gases and gaseous ammonia are admitted at the outlet of the drier, and pass along in a direction opposite to the travel of the salt. The latter, after passing through the neutralizer, is passed over a screen, and any lumps still remaining are carried forward into a small grinding mill.

The calculation for the amount of ammonia gas required is appended:

Estimation of Gaseous Ammonia to Neutralize One Centrifugal of Sulphate of Ammonia.

Weight of sulphate of ammonia contained in one centrifugal . . . = 3 cwt.
Percentage of free acid. . . . . 0·3 p.ct.
Weight of acid to be neutralized. . 0·003 × 3 cwt.
= 0·009 cwt.

$$\text{Amount of gaseous ammonia required to neutralize 0·009 cwt. of sulphuric acid} = \frac{34}{98} \times 0{\cdot}009 = \frac{34}{98} \times 0{\cdot}009 \times 112 \text{ lbs.}$$

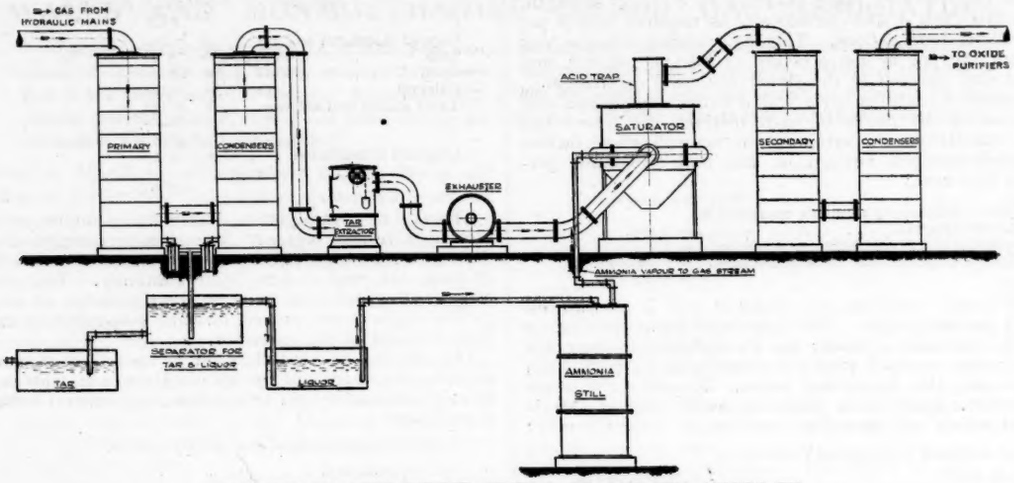
Weight of 1 c.c. of hydrogen . . . = 0·0000893 gramme
,, ,, 1 c.c. of ammonia . . = 0·0000893 × 17
Number of grammes in 1 lb. . . . = 453 593
1 c.ft. . . . . = 28315·31 c.c.

$$\text{Therefore 1 lb. of } NH_3 = \frac{453{\cdot}593}{28315{\cdot}31 \times 0{\cdot}0000893 \times 17} \text{ c.ft.}$$

Therefore the amount of gaseous ammonia to neutralize one centrifugal of salt

$$= \frac{34 \times 0{\cdot}009}{98} \times 112 \times \frac{453{\cdot}593}{28315{\cdot}31 \times 0{\cdot}0000893 \times 17} = 3{\cdot}9 \text{ c.ft. (practically 4 c.ft.)}$$

This experiment turned out satisfactorily on a small scale,



OUTLINE OF SEMI-DIRECT SYSTEM OF AMMONIA RECOVERY.

and also, I believe, gives excellent results on a complete plant.

Ammonium carbonate was next tried as the neutralizing agent; the following being the calculation for the amount required:

Weight of ammonium carbonate to neutralize
1·008 lbs. of sulphuric acid . . . . . $= \frac{96}{98} \times 1{\cdot}008$
$= 0{\cdot}99$ lb.

The ammonium carbonate was used in the powdered form, and proved to be very successful. The method was effective, both as an efficient means of neutralization, and as a labour saving proposition, and after a period of one month as an experiment was adopted as the permanent method of neutralization on the plant.

The usual procedure of washing the fugal of salt with 2 gallons of hot water is carried out. After being dried in the centrifugal whizzer, the salt is dropped into a mixing chamber, where, before passing through the final drier, it is thoroughly mixed with the calculated amount of ammonium carbonate.

The salt obtained by this method proved to be satisfactory in every way, and all consignments sent away contained the maximum nitrogen content—*i.e.*, 21·10 p.ct.—and therefore obtained the highest price. It had an exceptionally good appearance. The moisture content was also reduced (as compared with neutralization by means of a solution), the maximum content being 0·1 p.ct. This, of course, is a great advantage for storage and export.

It has been previously suggested that dissociation takes place on storing sulphate of ammonia neutralized with ammonia solution. An examination of the salt after neutralization with ammonium carbonate, and its behaviour on storing, was carried out. One bag of neutral sulphate was sewn up and stored under a heap of bags, each containing 2 cwt. of salt, and left for three months. After the expiration of this period, the salt was examined. The two points noteworthy were the absence of any caking, and the elimination of any dissociation.

The most complicated and undesirable chemical problems of the manufacture, and particularly of the neutralization, of sulphate of ammonia are the reactions and inter-reactions of the aromatic bases, pyridine, quinoline, isoquinoline, and their derivatives and salts. This series is formed during the destructive distillation of coal, and is removed from the gas in the condensing and wet purification plant. The compounds are miscible with water in all proportions, and on this account are found in small quantities in the ammoniacal liquor supplied to the sulphate plant.

Pyridine reactions, as a rule, occur at two different stages in the manufacture of sulphate of ammonia, and the products of reactions are correspondingly found:

1. In the salt ejected on to the draining table.
2. In the condensed products of the waste gases—the devil liquor.

During the ammonia extraction in the still, the pyridine series is distilled into the saturator, wherein the smaller percentage reacts with the sulphuric acid, and is precipitated as the sulphate $(C_5H_5N)_2, H_2SO_4$, which is ejected with the ammonium salt. When strong basic neutralizing solutions are mixed with the ammonium salt, the pyridine is evolved from its sulphate—$(C_5H_5N)_2, H_2SO_4 + 2NaOH = 2\ (C_5H_5N) + Na_2SO_4 + 2\ H_2O$—the mass of salt retaining enough heat to condition reaction.

My own experience is that pyridine evolution is not very pronounced at this stage of manufacture, and is in any case effectively masked by free ammonia gases. The larger percentage of pyridine is not, however, materially affected by the sulphuric acid, but is carried forward by the waste gases, ultimately condensing-out in the devil liquor. A point worthy of note is that as the latter usually contains up to 0·1 p.ct. of ammonia, it is re-circulated with the ammoniacal liquor to minimize the total ammonia losses. Since pyridine production is effected only by carbonizing conditions, it naturally follows that its presence is experienced on some works more than on others.

Since this thesis is an endeavour to embody the results of personal experience and observations, a few notes on the purification of waste gases, while not essentially connected with the general trend of the subject, are not beyond its scope.

A condition demanded by the Factories Act is the effective removal of sulphuretted hydrogen from the waste gases; and for this purpose the latter are passed through heaps of oxide of iron; the gas flow being regulated by hydraulic valves. For purification purposes, six oxide heaps are employed, four of which are in operation, and two off for partial revivification.

The purifying material used is the oxide removed from the oil gas purification plant. Oil gas oxide, in all cases, is not very suitable for sale purposes, on account of the high percentage of tarry matter it contains; but after being subjected to hot waste gases from the sulphate plant, this tar constituent is partly volatilized, and its percentage reduced.

The following analysis gives a constituent comparison of the oxide of iron from the oil gas plant purifiers, before and after use in sulphate purification:

	Before. P.Ct.		After. P.Ct.
Sulphur (wet basis)	28·75	..	46·55
Water	20·10	..	14·20
Tar	8·75	..	4·10

Sulphate of ammonia, though long one of the least appreciated, is now one of the most important bye-products of gas manufacture. Complete plants for its manufacture and neutralization are now installed upon nearly every gas-works of note, while practically all the existing plants have been fitted with neutralizing equipment. No more adequate criterion of the growing importance of neutral sulphate of ammonia is necessary; and it is not too much to say that such steady development is the outcome of chemical and physical application and supervision.

At the present moment considerable attention is being given to the semi-direct process of ammonia recovery, and also to final acid washing. The Bournemouth Gas Company have worked acid washers for many years with complete success. In respect of this latter process, it is claimed, and I believe proved, that not only is there a saving in the water usually required for removing the last traces of ammonia, but there is also a great saving in steam for distillation, because the liquor is more highly concentrated, and is less in quantity, to the extent of 10 to 12 gallons per ton of coal carbonized; and, of course, the effluent liquor from the stills is reduced in proportion. From this one might almost conclude that, if a combination of ammonia scrubbers and acid washers is a sound proposition, it would be a still sounder one to absorb the whole of the residual ammonia—*i.e.*, that left in the gas after the primary condensers—in saturators of the semi-direct design. Indeed, the writer is of opinion that much more will be heard of the semi-direct process of ammonia recovery in relation to gas-works practice in the near future, particularly on the larger works.

Discussion.

Mr. R. J. WILLIAMS (Abertillery) said that at Abertillery they had remodelled their plant, putting in dual saturators side by side, with change-over valves. A test of the salt showed it to be neutral.

Mr. MUIR observed that the price of sulphate was certainly not satisfactory. Blame in this connection rested with the Government. During the war the price was restricted, and now the market suffered through the introduction of reparation fertilizers.

Mr. PARKER (Messrs. W. C. Holmes & Co.) endorsed Mr. Bateman's remarks in regard to the complete success of the Bournemouth Gas Company's system of final acid washing for ammonia. His Company had installed such plant at the Pitwines Works, and Mr. P. G. G. Moon, the Company's Chief Engineer, had afforded the speaker an opportunity of making a thorough investigation of the process. Great economies in steam for distilling liquor were effected, while there was also a saving of water for scrubbing, in addition to which there would be a reduction in capital expenditure, since the ammonia stills and storage capacity for liquor were not so large as they would be normally, if an extra 10 to 15 gallons of water per ton of coal carbonized had to be used for washing the ammonia out of the gas. He agreed with Mr. Bateman that, within limits, and in so far as efficient removal of tar-fog permitted, the temperature of the gas leaving the condensers could be higher without causing a loss of ammonia, since it was as easy to remove the ammonia from the gas by bubbling it through acid at (say) 25° to 30° C. as it was at 15° C. This latitude in regard to temperature of the gas leaving the condensers meant two things—(1) purification by oxide could be more effectively controlled in winter, and (2) great economies could be effected in the consumption of water required for cooling the gas, particularly on works using town water. The same latitude in regard to temperature of the gas at the outlet of the condensers was not permissible where the ammonia had to be removed by water in washers, because, in order to make the strongest possible liquor with the least quantity of water, it was always desirable to cool the gas effectively. With regard to the semi-direct system, he had experience of such processes on coke ovens, and it had always puzzled him why gas engineers had not given this process more serious thought. He was in agreement with Mr. Bateman in his statement that much more would be heard of this process in the near future. Undoubtedly a properly-designed and well-arranged semi-direct plant was simple to operate, and on suitably sized works lent itself to economies of labour, steam, plant, and water, which were not always possible on the ordinary indirect plant. It was pleasing to note that the younger end of the industry was giving this and other associated matters such serious and close attention; and one must admire Mr. Bateman for so confidently and fearlessly expressing his views. With regard to the caking of salt, Mr. Parker said that uniformity of size of crystals was very important, as had been suggested, but expressed the opinion that no matter what the size of crystals might be, if they always remained dry they would never cake. In certain atmospheres, dry salt absorbed moisture, or moisture was condensed on to the salt, which on re-evaporation in drier atmospheres caused cementation to take place. The solution of the difficulty of caking would appear to lie in loading the salt into moisture-proof bags or packages.

Mr. T. V. BLAKE (Cardiff), in proposing a vote of thanks to the author, said that tests at Cardiff showed that 60 p.ct. of the total ammonia formed from the coal was deposited at the condensers. He would like to know whether Mr. Bateman thought the direct process would afford any great economy, seeing that it would be necessary to liberate the ammonia in the secondary liquor still in the ordinary way.

Mr. A. J. JENKINS (Rhondda) seconded the vote.

Mr. BATEMAN, responding, said he was of opinion that the semi-direct process offered great possibilities for works of almost any size, as it would reduce both storage and distillation apart from the reduction in capital expenditure in final washing plant which would be eliminated. With regard to the future prospects for sulphate, he certainly considered the price of acid to be far too high, but he was optimistic enough to believe that the new processes would bring about economies in the cost of manufacture. With regard to condensation, &c., with a view to the semi-direct process, it must be borne in mind that dealing with gas from horizontal retorts was a totally different proposition from dealing with gas from steamed verticals. As regards the caking of sulphate, the salt, if thoroughly dried in the first place, could not possibly cake unless it was brought into contact with moisture during transit; and he thought the bagging process at present in use might easily be improved.

SIMULTANEOUS PRODUCTION OF CHEAP GAS AND ELECTRICITY.

By C. B. TULLY.

At the present moment the gas industry has got plenty to think about in connection with the Coal Commission report and the Government's electricity scheme. The whole question of fuel is very rightly occupying the minds of all who are in any way interested in the production or utilization of power; and at such a critical time it behoves us to leave no pathway unexplored which might lead to a really sound and permanent solution of the one great problem of what to do with our coal in order to get the utmost value out of it. For really that is what we are all trying to discover. The crying need of the day is cheap fuel, and plenty of it; and every engineer who has tackled the problem from the right point of view knows that in the end it resolves itself into the question of how to treat coal. The Coal Commission report puts the whole thing in a nutshell:

> It has been strongly impressed upon the Commissioners, as the outcome of their inquiries, that it is an error to suppose that the only, or even the principal, object to be aimed at in this connection is the most economical method of producing electricity. The object to be aimed at is the most economical and efficient way of utilizing the energy embodied in the coal.

It is my opinion that both the manufacture of gas and the generation of electricity are in the melting pot; and the Government would be well advised to wait further developments before launching the electrical industry into financial obligations that will involve them in a heavy burden of debt for a generation to come. My contention is that the super-generating stations at present contemplated form only part of the problem of national heat and power requirements, and should not be considered apart from the highly important subject of the provision of economical gas supplies for industrial purposes. The combination of the two can undoubtedly be achieved with economy to both; and it is the purpose of this article to show how this can be done.

THE TULLY-YEO PLANT.

I am convinced that gas undertakings could generate electricity and supply it in bulk to the electricity undertakings at a cheaper rate than they can do it themselves, and at the same time cheapen the cost of the gas supply to the public; and I propose to describe a plant by means of which gas and electricity can be manufactured simultaneously in such a way as to enable the distribution of both to be carried out in a highly efficient and economical manner. This plant makes a gas of 450 B.Th.U. and a gas of 300 B.Th.U.; the idea being to supply the 450 B.Th.U. gas in the usual way, and to convert the 300 B.Th.U. gas into electricity.

The Tully-Yeo plant, invented by Mr. S. J. B. Tully and Mr. Oliver E. Yeo, is a modification and improvement of the old Lewes-Tully methane hydrogen plant. It is the result of experience gained by the inventors over the last ten years, and, in my opinion, represents a development in the science of coal carbonization which is destined to have a far-reaching influence upon the whole question of fuel production. It consists of a vertical retort A (fig. 1) superimposed over a producer C. The fuel—coal, or mixtures of coal and coke—is fed into the retort through the charging door G. The coal in passing through the retort is carbonized by means of the sensible heat of the red hot water gas generated in the producer, and also by the heat passing through the walls of the retort from the checker chamber U surrounding it.

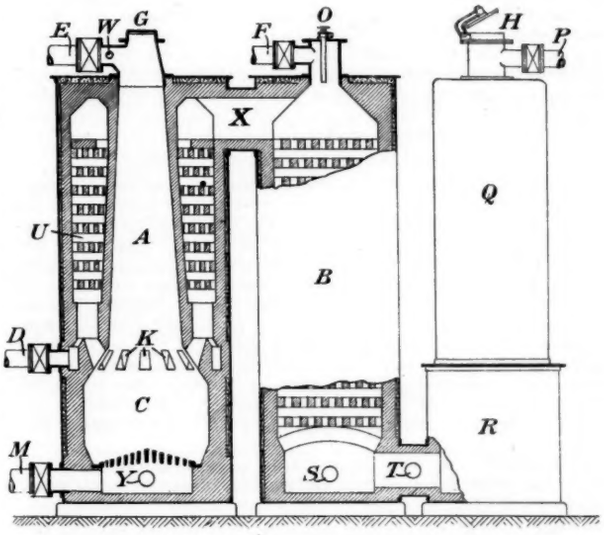


Fig. 1.—The Tully-Yeo Plant, with Carburettor and Waste-Heat Boiler.

The fuel is blown to incandescence for two minutes; the hot gases passing through the nostrils K at the base of the retort, through the checker chamber U, and by way of the duct X into and down the carburettor B, from which they travel into the boiler combustion chamber R, up the boiler Q, and away to the atmosphere by the snift valve H. The main blast enters the generator under the grate by way of the primary blast valve M. Secondary air is admitted at D into the air

belt at the base of the chamber U through suitably arranged ports, in order to burn part of the combustible blow gases required to heat the retort A. A further supply of air is provided at F for heating the carburettor; and another air supply is provided at S to burn any combustible gases left in the blow gases before entering the boiler Q.

When the desired temperature is obtained, the stack valve is closed and steam admitted at Y. The steam is decomposed in the producer C, and (say) 75 p.ct. of the hot water gas generated is passed up through the fuel in the retort A, and away by the gas outlet pipe E. The remaining 25 p.ct. passes through the nostrils X into the checker chamber U, and by way of the duct X into the carburettor B, where it can be carburetted by the addition of gas oil, introduced at O. In case of the gas being carburetted, it will pass to the foul main through the nostrils X into the checker chamber U, and by way required as blue gas, it will pass through R and the boiler Q, and away by the pipe P; and in this case the sensible heat of the gas will be used for the production of steam. Of course, the carburettor can be eliminated from the construction in such cases where blue gas only is required as a residual.

On completion of the run, which may take from four to five minutes, the valves E and P are closed, the stack valve H is opened, the secondary air valves M, D, and S opened as required, and the plant heated-up for the next run. A gas take-off pipe W is arranged, conveniently coupled-up to the foul main, with a pull from the exhauster, with the object of drawing off all the rich coal gas generated in the retort A during the blow or when clinkering or standing off. The only time this valve need be closed is when the plant is being coaled-up or when closed-down.

Realization of Some Carbonizing Ideals.

This plant embodies all the details of the late Prof. Vivian B. Lewes mentioned in his book "The Carbonization of Coal," written by him some fourteen years ago. Prof. Lewes suggested not only using water gas as a diluent, but that it should be made a factor in the distillation itself. He proposed that water gas should be added through the crown of the retort during the process of carbonization, so as not only to hurry the newly-made hydrocarbon gases out of contact with the hot walls of the retort, but also, by diluting them, to prevent the secondary reactions which are such important factors in preventing the production of tar from taking place, and by so doing to save many of the important lighting and heating constituents from destruction. He further recommended that coal should be distilled in a stream of red-hot water gas, and points out that by doing so a perfect control of temperature can be obtained.

It will be seen that in the Tully-Yeo process the products of the primary action of the carbonization of the coal in the retort are not subjected to secondary decomposition, and that their valuable heat and light giving properties are therefore retained in the gas produced. It will also be noticed that, by regulating the quantity of gas taken through the carburettor, the distillation temperature in the retort can be controlled.

According to Prof. Lewes, the primary gas distilled in an atmosphere of gas at a temperature of about 450° C. will have a composition approximately as follows: Hydrogen, 21·2 p.ct.; saturated hydrocarbons, 60·1 p.ct.; unsaturated hydrocarbons, 6·3 p.ct.; and the calorific value would be about 750 B.Th.U. If these gases were distilled at 900° C., their composition would be approximately: Hydrogen, 54·5 p.ct.; saturated hydrocarbons, 34·2 p.ct.; unsaturated hydrocarbons, 3·5 p.ct.; and the calorific value would be about 550 B.Th.U.

Gas Instead of Coke as a Residual.

In the Tully-Yeo process, the primary hydrocarbons escape degradation, and the progressive distillation takes place in zones of increasing temperatures; the resulting coke being delivered into the generator proper at the base of the retort red hot. The main object of the plant is to carbonize coal with the production of gas as a bye-product in place of coke. It produces gas of 450 B.Th.U., suitable for all the requirements of a town gas supply; but, instead of producing coke as a bye-product, the plant provides fuel in the form of 300 B.Th.U. gas, which can be converted into electricity and sold to the local electricity undertaking, or disposed of in some other profitable way. This saves all the worry and anxiety of an ever-fluctuating coke market, and the expense and labour of handling this product.

The capital cost of the plant will be as much as one-third less than any other form of coal carbonizing plant. The maintenance cost will be about the same, and the wages less than half. In regard to the fuel cost of the gas, with coal at 24s. per ton gross, or (say) 20s. net (allowing for tar and sulphate of ammonia), one therm of 350 B.Th.U. gas for fuel alone, at the rate of 200 therms per ton, will be 1·2d. To enrich this gas up to 500 B.Th.U. will require 1½ gallons of gas oil at 5d. per gallon, which increases the cost to 1·68d. per therm.

If the 200 therms of 350 B.Th.U. gas be divided into two streams as follows:

350

112 therms 450 B.Th.U. 88 therms 300 B.Th.U.

we get 112 therms of 450 B.Th.U. gas at 1·2d. per therm for fuel, and 88 therms of 300 B.Th.U. gas at 1·2d. per therm. It will require half a gallon of gas oil per 1000 c.ft. to enrich the 450 B.Th.U. gas to 500 B.Th.U., bringing the cost per therm (for fuel only) to 1·59d. The 88 therms of 300 B.Th.U. gas, if burned in modern gas-fired boilers with modern steam generating plant, will produce at full load 533 units of electricity, costing, for fuel, at the switchboard, 0·198d. per unit. If used in gas engines, the same amount of gas would produce at full load 652 units at the switchboard, at a fuel cost of 0·162d. per unit.

The Triple Generator.

Fig. 2 shows a special design of the Tully-Yeo plant, known as the triple generator, which embodies all the principles of the new process with a view to obtaining the maximum possible efficiency from this system of carbonizing. It produces a constant stream of gas and a constant supply of hot gases to the waste-heat boiler. It consists of three units, one of which is being blown to incandescence while the other two are being steamed or are making gas. The cycle is six minutes—two minutes for the blow, and four minutes for the run. The constant supply of blow gases passes through the waste-heat boiler, delivering up their useful sensible heat for the production of steam. This boiler produces the steam necessary for running

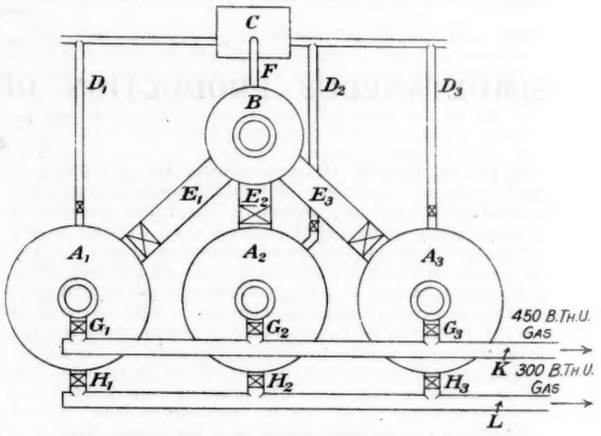


Fig. 2.—The Triple Generator Complete Gasification Plant.

A, 1, 2, 3—Generators
B—Waste-heat boiler superheater
C—Steam turbo blower
D, 1, 2, 3—Exhaust steam to generators
E, 1, 2, 3—Blow gases to boiler
F—Steam to steam turbo blower
G, 1, 2, 3—450 gas foul main
H, 1, 2, 3—300 gas main

the steam turbo blower, the exhaust steam from which is used to steam the plant, either superheated or not. This improved plant will completely gasify any suitable coal; and any class of coal can be used if mixed with coke or any non-coking coal.

In the latest system of operating this plant, the 200 therms of 350 B.Th.U. gas is divided-up into two streams. One of these is a mixture of coal gas and water gas approximately 450 B.Th.U., and the other consists of blue gas of 300 B.Th.U. As I have already pointed out, the 450 B.Th.U. gas can be supplied for all purposes required of an ordinary town gas supply; and the 300 B.Th.U. gas, which takes the place of coke, can be distributed for industrial purposes, or, as I suggested at the beginning of this article, can be converted into electricity on the works, and then sold in bulk to the local electricity undertaking.

By this scheme, electricity could be generated at any gas-works far cheaper (as I have shown) than by any other means; and I maintain that this is a suggestion which the gas industry cannot afford to neglect at the present time, in face of the competition in the near future of a Government-aided electrical industry.

North British Association of Gas Managers.—The spring meeting of the Association will be held on Friday, April 2, at Motherwell. Papers will be read by Mr. W. E. Whyte (Clerk to the Mid-Lanark District) on "The Question of Amalgamating Gas Undertakings in Scotland," and by Mr. David Fulton (Helensburgh) on "Policy in Developing Gas Sales."

Institution of Chemical Engineers.—Examinations for the Associate Membership of the Institution will be held in June and July next. Particulars of the examinations, and the memorandum on the "Training of a Chemical Engineer," may be obtained on application to the Hon. Registrar, Mr. C. S. Garland, Abbey House, Westminster, S.W. 1.

MIDLAND JUNIOR GAS ASSOCIATION.

[Working results of a Woodall-Duckham vertical retort installation at the Wolverhampton Gas-Works are given in a paper read by Mr. W. Macnaughton at this meeting of the Midland Juniors. The author describes in considerable detail the carbonizing plant at the Stafford Road Works.]

There was a large attendance of members of the Association at a meeting in the Birmingham Council House on Thursday, March 18. Mr. J. H. GEE (President) was in the chair.

The PRESIDENT cordially welcomed Dr. E. W. Smith, of London, an honorary member of the Association; and he also congratulated Mr. L. H. Thomas (Past President), of Birmingham, upon receiving an important appointment at Smethwick. They appreciated the work he had done on behalf of the Association; and it was a matter for satisfaction to them that he would continue to be within their own area.

The SECRETARY expressed the hope that members would return to him at once post-cards in relation to the forthcoming visit (April 17) to the works of the South Metropolitan Company, so that the necessary arrangements might be made.

RECENT DEVELOPMENTS AT STAFFORD ROAD GAS-WORKS, WOLVERHAMPTON.

By W. MACNAUGHTON, of Wolverhampton.

During the last year or so, one has been interested in reading in the technical journals the many and varied claims put forward by those interested in the carbonization of coal in vertical retorts—especially regarding the gas-making life of the particular plant in use. It is almost impossible to compare the gas-making life of any one plant with that of another, unless one has some knowledge as to classes of coals carbonized, working temperatures of retorts, and actual quantity of coal carbonized over a certain period. It is my intention at the commencement of this paper to put before you, as briefly as possible, our experiences with our first installation of vertical retorts, or what we term our "trial installation."

In June, 1920, it was decided to instal vertical retorts, and an order was placed with the Woodall-Duckham Company for one bench of four settings, each setting containing four retorts and one producer. The retorts were of the then standard "W.D." 5-ton type, having retort walls built with 4½-in. panels with 8 ft. depth of silica material. The retorts were also fitted for steaming the charges. The plant was built outside the inclined retort house, and in such a position that coke could be handled by the existing telpherage plant. The stream of gas was passed through separate condensers, exhausters, scrubber, purifiers, and station meter; also separate tanks were installed for measuring tar and liquor.

Gas making commenced on Sept. 12, 1921, and the four beds worked continuously until June 10, 1924. On examination of the producer linings early in 1924, it was evident that they would have to be repaired, and Nos. 1 and 2 beds were shut-down for that purpose on June 10, 1924 (see Tables I. and II.) When No. 1 bed was ready for work, No. 3 bed was shut-down (see Table No. III.). No. 4 bed was shut-down on Aug. 25, 1924 (see Table No. IV.). During the time the beds were off, all inside retort face joints were cleaned out, and pointed with a mixture of fireclay, silica sand, and "Korktite."

On examining the top part of the retorts when cold, it was apparent that they would have to be reset during the summer of 1925, and also that new cast-iron retort mouthpieces would be required, as in some cases the mouthpieces had bulged inwards from the original 7 in. breadth to 5⅛ in., and in other cases to 5 in. In May, 1925, an order was placed with the Woodall-Duckham Company for the following:

> Pulling-out and rebuilding of the brickwork in 16 retorts for a depth of approximately 8 ft. from top of setting level.
>
> The retorts to be rebuilt generally on the lines existing at present with special quality silica and first-quality fireclay material.
>
> New cast-iron mouthpieces of the latest shallow type to be provided and fitted to the retorts.
>
> The four generator flues to be washed thoroughly with fire cement throughout.

We commenced shutting-down the beds for this purpose on March 7, 1925 (see Tables I., II., III., and IV.). Much to our disappointment, when the settings were let-down for resetting the tops of the retorts, it was seen that the producer linings were in as bad a state as they were in 1924. This can only be attributed to the quality of the fireclay material used. On getting-down to the silica belt in the retorts, it was found that in every case the silica bonding bricks were in a much worse state than the silica panels—in fact, most of the panels seemed in perfect condition. In extracts from a paper by Mr. T. F. E. Rhead, M.Sc., and Mr. R. E. Jefferson, M.Sc., read before the Ceramic Society, published in the "Gas World" of June 20, 1925 [the paper was reproduced in full in the "JOURNAL" for July 22, 1925], I notice that these gentlemen comment on a similar case, as follows:

> The bricks showing the worst spalling are silica bonding bricks which pass from the retort face to the back of the combustion flues. This may be due to an inherent property of the material, or, as suggested by Mr. W. T. Gardner, to the effect of pressure in moulding, the panel bricks being pressed with the front face down, while the bonders are pressed with the front face vertical. This might cause the granules to arrange themselves differently in the two bricks.

When gas making commenced after relining producers in 1924, some difficulty was experienced in the working temperatures of the retorts. The average temperatures could not be got any higher than 1200° to 1250° C., against our former average temperatures of 1260° to 1300° C.; the only apparent reason being that the waste-gas outlets to the main flue were not cleaned-out, as since resetting the tops of the retorts and cleaning the waste-gas flue outlets and main flue in 1925 no trouble has been experienced in keeping a regular working temperature of 1320° to 1340° C.

TABLE No. I.—*No. 1 Bed.*

Gas Making Commenced.	Let-down for Repairs.	Remarks.
Sept. 12, 1921	June 10, 1924	Producers partly relined and inside retort walls pointed
July 27, 1924	May 25, 1925	Producers partly relined and top of retorts reset
Oct. 9, 1925		

TABLE No. II.—*No. 2 Bed.*

Sept. 12, 1921	June 10, 1924	Same as No. 1 bed
Aug. 25, 1924	May 25, 1925	Same as No. 1 bed
Oct. 9, 1925		

TABLE No. III.—*No 3 Bed.*

Sept. 13, 1921	July 27, 1924	Same as No. 1 bed
Sept. 19, 1924	April 8, 1925	Same as No. 1 bed
Nov. 12, 1925		

TABLE No. IV —*No 4 Bed.*

Sept. 13, 1921	Aug. 25, 1924	Same as No. 1 bed
Sept. 30, 1924	March 7, 1925	Same as No. 1 bed
Nov. 30, 1925		

REPAIRS TO DATE.

1924.

Producer linings, 472 — 9 in. by 6 in. by 3 in. fireclay broadbacks, with necessary mortar. Pointing of inside retorts.

1925.

Producer linings, 475 — 9 in. by 6 in. by 3 in. fireclay broadbacks, with necessary mortar.
Resetting retorts to a depth of 8 ft., with 16 new cast-iron mouthpieces.
Pointing of inside retorts below reset level.
4 centre producer castings.
8 water channels (2 per producer).
48 drip plates (12 per producer).
15 coke discharge hoods or doors.
1 complete coke extractor box.
1 coke extractor rocking arm and wheel.
8 side plates for coke discharge boxes.
8 end plates " " " "
5 top plates " " " "
72 ft. water troughing.
16 ft. indicator chain.
1 wire rope for lift.
36 ft. of 1 in. steam tube.
1 set of piston rings for extractor gas engine.
1 cast-iron producer cover.

The gas made and coal carbonized from Sept. 12, 1921, to May 25, were as follows:

Gas made, corrected to 60° Fahr., 30 in. bar.	1,442,509,000 c.ft.
Coal carbonized (moist)	85,937 tons
Average calorific value, gross	455 B.Th.U. per c.ft.
Tar recovered per ton of coal carbonized	15 4 gallons
Liquor " " " " " 10 oz.	30·4 "

The results since resetting the top of retorts up to Jan. 28, 1926, are as follows (two beds off five days during Christmas holidays):

Gas made, corrected to 60° Fahr., 30 in. bar.	104,336,000 c.ft.
Coal carbonized (moist)	6,397 tons
Make per ton	16,310 c.ft.
Average calorific value, gross	469 B.Th.U. per c.ft.
Therms per ton of coal carbonized	76·49
Coal carbonized per retort per 24 hours	4·82 tons
Tar recovered per ton of coal	15·1 gallons
Liquor " " " " 10 oz.	28 4 "

With a reduction in throughput, the following are now the average weekly results obtained :

Gas made, corrected to 60° Fahr., 30 in. bar.	7,523,000 c.ft.
Coal carbonized (moist)	444 tons
Make per ton	17,169 c.ft.
Therms per ton of coal carbonized	80·0
Average calorific value, gross.	466 B.Th.U. per c.ft.
Average number of retorts working	14
Average quantity of coal carbonized per retort per 24 hours	4·53 tons
Tar recovered per ton of coal carbonized	15·8 gallons
Liquor " " " " " , 10 oz.	26·4 "
Fuel to producers	12·8 p.ct.

The classes of coal now carbonized are a mixture of South Yorks, North Staffs, Notts, and North Wales.

Since resetting the tops of the retorts, rodding has been reduced to a minimum, and there is now no trouble with stoppages in the offtake pipes. We expect that, by working at the same temperatures as at present, the settings will go on continuously gasmaking till the summer of 1928. Possibly the producers may have to be partly relined during the summer of 1927.

During the latter part of 1923, the question of new carbonizing plant was carefully considered; and after our experiences with vertical retorts, it was then decided to put in another installation. Owing to our coal handling plant being rather obsolete—for instance, wagons were unloaded by manual labour—it was decided to instal an up-to-date handling plant in such a position that it would supply the coal, and also the coke required for the producers, to the vertical plant already installed, the new vertical installation, the intended future carbonizing plant, and also some beds of inclined retorts, if the latter were again required.

Our inclined retort house contained four ranges of 6 beds, with a maximum daily output of 2·6 million c.ft. of coal gas. The scheme arrived at was to instal in this house four beds of verticals. To do this, it was necessary to dismantle No. 4 range of inclines, one bed from No. 3 range, and the chimney serving both these ranges. To make room for the gravity-bucket conveyor trench, we had to dismantle one bed on No. 1 range.

An order was placed with the Woodall-Duckham Company for the following :

(1) Dismantling and removing all material from eight beds of inclined retorts and one brick-built chimney.
(2) Erecting end walls, and re-erecting the ironwork on two beds of inclines.
(3) Installing complete coal and coke handling plants.
(4) Erecting four beds of vertical retorts, with waste-heat boiler.
(5) Altering position of telpher track so as to deal with the coke from the new vertical plant.
(6) All excavation work and foundations for new plants.

The position decided upon for the wagon tippler was in the main coal store, which is built alongside the inclined retort house. The coal store was served by a single line of elevated railway siding running almost the entire length of same. To facilitate handling a large number of wagons, it was decided to make an outlet at the end of the main coal store, and extend the elevated railway siding to our main railway sidings by means of a reinforced concrete gantry 123 ft. in length. Owing to difference in levels we had to increase the height of the sidings in the main coal store by 2 ft. 6 in. at the entrance end, and 1 ft. 6 in. at the outlet end; and to avoid disturbing the supporting structure, a reinforced concrete beam was cast on the longitudinal steel girders.

The composition of the concrete used in this was as follows :

Mass Concrete.

Broken brick	6 parts by measure
Best clean sharp sand	3 " "
Pure British portland cement	1 part " "

Reinforced Concrete.

Broken brick	4 parts by measure
Best clean sharp sand	2 " "
Pure British portland cement	1 part " "

Extra care was taken to screen the broken brick after crushing, so that all dust was removed. All concrete was mechanically mixed. The reinforced concrete wall in the coal store and the reinforced concrete gantry formed a separate contract, which was carried out by Industrial Constructions, Ltd., of London.

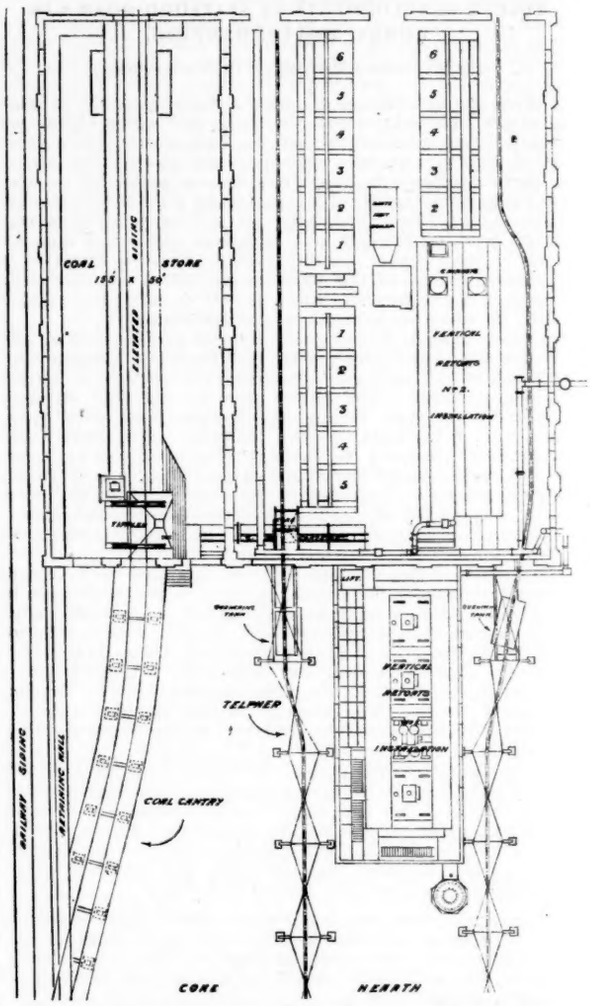
COAL AND COKE HANDLING PLANT.

The wagon tippler is of the rotary type, capable of dealing with coal wagons, including hopper wagons, having a maximum net load of 15 tons. It is driven by a 7-H.P. motor through suitable reduction gear, and equipped with electric clamping gear operated by an independent 5-H.P. motor. The tippler consists of two rings, each having inner and outer flanges of two mild-steel angle bars securely riveted to mild-steel web plates, and fitted with cast-iron balance-weights. The rings are firmly attached to cross girders, the bottom pair of girders having a platform, fitted with bridge rails of 4 ft. 8½ in. gauge to carry the coal wagons. Starting panels for both clamp and rotating motors are placed side by side, and in such a position that the operator can see at a glance if the wagon is in the right position. The regulating handle for the coal feed to the coal breaker is also fixed on this platform.

To take delivery of the coal from the tippler, a receiving hopper of a capacity of from 25 to 30 tons is suspended from the elevated siding. This hopper is built-up of mild-steel plates strongly stiffened with angles and tees, and fitted with a slide at its outlet, to regulate the feed of coal to the breaker.

Underneath the coal hopper is a single roll crusher, driven by a 20-H.P. motor, capable of crushing 40 to 50 tons of bituminous run of mine coal per hour. The crusher consists of a heavy cast-iron frame on which is mounted a crushing roll and a breaker plate. The latter is hinged at the upper end, and held in position by a pair of adjusting rods at the lower end, so arranged that the clear opening between the breaker plate shoe and the surface of the roll can be varied to suit the product required. The crusher is set to give a product of from 2 in. to 3 in. cube.

The large coal is fed to the crusher by means of a jigging screen. The small falls through into a by-pass chute, and thence, with the broken coal, through a rotary filler into the gravity-bucket conveyor. The latter is capable of dealing with 45 to 50 tons of broken coal per hour, and is driven by a



General Scheme of Carbonizing Plant at Stafford Road Works.

12-H.P. motor. It is arranged in a position to take delivery of the broken coal from the breaker, feed it through suitable chutes on to the push-plate conveyor serving the 5-tonners, or through a chute to the hopper supplying five beds of inclines, or deliver on to the tipping-tray conveyor serving the new installation of verticals.

The gravity-bucket conveyor also delivers to the tipping-tray conveyor the coke for the producers of the new vertical installation. The latter conveyor, of a size capable of dealing with 45 to 50 tons of broken coal per hour, is driven by a 7-H.P. motor. It is complete with the necessary framework and bracing, carried up from the top of storage hoppers, a travelling two-way chute, and dumper, guides, automatic oiler, and tension gear. In the event of another four beds of verticals being built in line with the present ones, the coal and coke required will be handled by simply extending this tipping-tray conveyor.

The coal and coke handling plant was supplied and erected by Messrs. Babcock & Wilcox, as sub-contractors to the Woodall-Duckham Company.

The labour employed on the coal and coke handling plant is

3 men, who are responsible for all oiling, greasing, cleaning of wagon tippler, and sweeping-down all platforms and the gravity-bucket conveyor trench.

The electric motors throughout the installation were manufactured and supplied by the Electric Construction Company, Wolverhampton. They are of the totally-enclosed compound-wound type, suitable for operating upon direct current of 220 v.

No. 2 Installation. 7-ton "W.D." Vertical Retorts.

The necessary concrete foundations for the setting stanchions are in the form of a reinforced concrete raft, the bottom of which is 5 ft. 6 in. below the retort house floor level, at which point the subsoil is composed of good stiff clay. The size of the raft is 81 ft. 8 in. in length and 26 ft. 6¾ in. in breadth. The composition of the concrete used was as follows:

Broken brick	5 parts by measure
Best clean sharp sand	2½ ,, ,, ,,
Pure British portland cement . . .	1 part ,, ,,

The concrete was mechanically mixed, and continuous concreting took place during the construction of the raft.

The settings are built on the well-known "W. D." principle; the most important points being:

(1) Each setting is absolutely separate from the next. A straight joint, ⅜ in. wide, is provided, so that any expansion can be taken up; and provision is made so that each setting can be heated-up or cooled-down without in any way affecting the adjoining one.

(2) Each setting contains four retorts, so arranged that either one, two, three, or four retorts can be worked at one time by one producer.

(3) The retort faces and combustion chambers are constructed of best quality silica material for a depth of approximately 17 ft. below the combustion chamber nostrils. The retort walls are formed of 3-in. solid material with bonding bricks both tongued and grooved.

(4) All the waste-gas outlets of the settings are connected to one main flue with a damper regulating each outlet to the chimney.

(5) Producers are fitted with step grates, with steam and water supplies, to reduce clinkering to a minimum.

(6) The front walls and top of the settings are faced with special hollow insulating and Moler bricks, outside of which there is laid a thick coating of special insulating material, to reduce to a minimum losses through radiation.

The main flue is brick built, supported on a concrete floor carried by rolled-steel channels and strongly braced by angles and round ties. Beyond the last bed the flue is returned into the chimney. The latter is erected on the top of the settings, having a height of 130 ft. above ground level. It is built of steel plates, and lined to its full height with 4½-in. firebrick, with 1½-in. space between the lining and the steel shell packed with slag wool. At the base of the chimney are two automatic air inlets, to ensure an even draught on the settings. A main damper is provided at the inlet of the waste-gas flue to the chimney, operated from the top of the setting.

One 14-in. retort-house governor is provided on the foul main at the top of setting level. It is complete with all necessary inlet, outlet, and by-pass valves and connections.

Waste Heat Boiler.

For dealing with the waste gases from the settings, a waste-heat boiler of the "W.D." design is provided with a guaranteed output, when 16 retorts are working, of 2800 lbs. of steam per hour from feed water at 60° Fahr. The boiler is of the horizontal firetube type, having an internal diameter of 8 ft. 1 in. The inward travel of the gases is through 146 2-in. internal diameter tubes 10 ft. 6 in. long, and the return travel through 192 tubes 1¾ in. internal diameter of the same length. The boiler is complete with main stop valve, twin safety valve, check valve, and water and steam pressure gauges.

One single-cylinder direct-acting vertical feed water pump of the Weir type is provided; working pressure, 120 lbs. per sq. in. Between the feed water tank and pump is provided a feed water heater for working with the exhaust steam from the engine driving the fan. An oil separator is fitted on the exhaust steam pipe between the engine and the feed water heater. To ensure the steam being dry when reaching the retorts, a superheater is fitted in the inlet flue to the boiler, capable of raising the temperature of the steam to 600° Fahr.

In order to provide sufficient pull on the settings, an induced draught fan is provided on the outlet of the boiler capable of giving a draught of 2 in. at the fan suction. The fan is driven by an 18 B.H.P. high-speed vertical engine through a chain drive.

The flue connecting the boiler to the main waste-gas flue is formed of steel plates lined with firebrick. Between the firebrick lining and the steel casing there is a 1½ in. packing of slag wool. The outlet flue from the boiler is also formed of steel, and taken back into the chimney bay of the settings. The connections of this flue are so arranged that, in the event of a second bench of retorts being installed and a second waste-heat boiler fixed, either of these boilers could be operated in connection with either bench, and could pass its waste gases into either chimney.

The waste-heat boiler was not ready when the beds commenced gas making, so I am unable to give you a full twelve months' results. Also, when the boiler was actually put to work, the water evaporated was not measured.

Results since Water has been Measured.

Wolverhampton Town Water.

Dates.	Number of Days.	Gallons Evaporated.	Gallons per Day.
From July 3, 1925, to Sept. 29, 1925	87	637,500	7330
,, Oct. 4, 1925, ,, Nov. 2, 1925	29	218,100	7510
,, Nov. 9, 1925, ,, Dec. 20, 1925	41	325,700	7940
,, Jan. 4, 1926, ,, Feb. 18, 1926	47	389,400	8280

Average temperature of gases at inlet of boiler tubes, 545° C.
,, ,, ,, ,, outlet ,, ,, 465° Fahr.
Vacuum at main flue, 6½-tenths.

The feed water to boiler is of an average of 17·5° temporary hardness and 4·9° permanent hardness (expressed as parts per 100,000). Since commencing, the colloidal system of treatment has been used—namely "Algor," as supplied by the Feed Water Specialists, of Liverpool.

The boiler was put to work early in May, 1925, and shut down for examination on Sept. 29, 1925. Much to our disappointment, the tubes were coated with scale varying in thickness from $\frac{1}{32}$ in. to ½ in. The greatest thickness of scale was on the tubes next to the mouth of the feed water pipe. To remove all the scale by manual labour was well nigh an impossibility; and the boiler was put to work on Oct. 4, using a stronger grade of "Algor." At the end of 29 days, we shut down the boiler again, for inspection, and were relieved to see the thickness of scale was reduced to $\frac{1}{16}$ in. Since then, using a liquid grade of "Algor," the boiler tubes have remained in a perfectly clean state. We are still having some trouble with scale in the water heater, but to obviate this we now introduce "Algor" into the feed pipe after the heater.

With reference to the cleaning of the inside of the boiler tubes or the removing of flue dust, which is generally done by wire brushes of different sizes, and the usual practice of limewashing to prevent any trouble with corrosion, for the limewashing we are now using a "Four Oaks" lime spraying machine with special nozzle which leaves an even layer of lime all along the tubes.

During the time the waste-heat boiler has been at work, the steam generated has been sufficient for driving the fan engine and feed water pump, for the supply to producers, and for that used for steaming the charges. With clean boiler tubes, and working 16 retorts, we find a surplus of steam; and we use this on the 5-ton installation.

The guarantee for the plant was as follows:

> When working with dry South Yorkshire screened gas coals, the volatile content of which is not less than 33 p.ct., and the ash content not more than 6 p.ct., it shall be capable of giving an output under steaming conditions, when all retorts are working, of 1,680,000 c.ft. of gas per day, measured at 60° Fahr. and 30 in. bar., of an average calorific value of 450 B.Th.U. (gross) per c.ft.
>
> The fuel used on producers (coke as it comes from retorts) would not exceed 13 lbs. per 100 lbs. of coal carbonized.

Gas making was commenced on Feb. 17, 1925.

The labour employed on the plant for carbonizing is as follows: One leading hand or retort-house foreman, who also supervises the 5-ton installation, being responsible for the working of both plants during his shift, making necessary alterations to dampers and slides if the retorts are being put off or going to work after scurfing, also increasing or checking heats on any individual retort if it should require same. He is also responsible for the shutting-down or starting-up of the waste-heat boiler.

One fireman, who attends to four fires, fills the producers every four hours, attends to the lubrication of the fan engine and feed water pump, the waste heat boiler, and augers offtake pipes once per shift.

Two top men, who attend to rodding of retorts, lubricate coal valves, keep coal boxes and platforms in a clean and tidy state, discharge coke into skips every two hours, push skips to a position underneath the telpher, and hook them on, and sweep-up floor after every draw.

Coke discharge seal pots are cleaned out every morning by a labourer whose time for cleaning 16 seal pots is three hours.

Retorts are scurfed every four to five weeks. This is done by two labourers, who, as a rule, scurf and fill two 7-ton retorts and one 5-ton retort per 8-hour shift.

Flue cleaning is done every four weeks.

Temperatures of both top and bottom of combustion flues and main flue are taken daily by a Foster pyrometer (disappearing filament type).

The average working temperature at the top is 1400° C., and the bottom—*i.e.*, at the control dampers—1200° C.

Daily analyses of producer gases, waste gases, and coal gas are made.

It may be interesting to note that in July, 1922, we commenced buying coal on the ash clause basis. After a few months, we completed arrangements for sampling and testing by analysis every wagon of coal received. This practice has been extended,

Working Results of No. 2 Installation of Woodall Duckham Vertical Retorts

Period. Thirteen Weeks Ended. 1925.	Gas Made, C.Ft., Corrected to 60° Fahr. 30 in. Bar.	Moist Coal as received from Works Weighbridge. Tons.	Gas Made, C.Ft., Corrected per Ton of Moist Coal.	Calorific Value B Th.U. Gross per C.Ft.	Therms in Gas per Ton of Moist Coal.	Average Number of Retorts Working per 24 Hours.	Average Coal Carbonized per Retort per 24 Hours. Tons.
May 21	145,393,000	9491	15,319	488·5	74·8	14·6	7·1
Aug. 20	165,881,000	9557	17,357	465·3	80·7	14·3	7·3
Nov. 19	174,872,000	9999	17,489	462·4	80·8	14·4	7·6
Feb. 18	165,307,000	9649	17,132	463·2	79·3	14·2	7·4

Period. Thirteen Weeks Ended. 1925.	Coals Carbonized. Percentage.						Crude Benzole Recovered per Ton of Coal Carbonized. Gallons.	Tar and Liquor Recovered per Ton of Coal Carbonized.		Fuel Actually Weighed to Producers. Percentage on Coal Carbonized.	Average Temperature of Gas at Inlet to Retort House Governor. °Fahr.
	S. Yorks.	N Staffs.	N. Wales.	Derby.	Notts.	Stock.		Tar. Gallons.	Liquor. 10-oz. Galls.		
May 21	46	26	14	3	3	8	..	15·1	31·1	11·8	148
Aug. 20	45	28	21	..	6	..	0·58	15·7	29·7	11·5	165
Nov. 19	42	24	26	..	5	3	0·69	16·5	28·5	11·3	156
Feb. 18	30	24	25	..	6	15	0·82	16·6	27·1	11·6	139

Calorific values for last three periods are those after benzole extraction.
Varieties of coals carbonized:

South Yorkshire . . Three varieties of screened nuts
North Staffs. . . . Three ,, ,, ,, ,,
One variety ,, ,, coal
North Wales . . . Four varieties of screened coal
Derbyshire . . . . One variety ,, ,, nuts
Notts. . . . . One ,, ,, ,, ,,

The coal in stock was a mixture of thirteen varieties, and had been in the open for over fifteen months.
Steaming nozzles, ⅜ in. Average pressure at inlet to nozzles when working with waste-heat boiler, steam 40 lbs. per sq. in. When the waste-heat boiler is shut-down, and using wet steam from Lancashire boilers, the average pressure is 16 lbs. per sq. in.
During the twelve months' working, the gas from the 7-ton retorts has been made, purified, and measured by a wet station meter, entirely apart from that of the 5-ton retorts.

until at present over 90 p.ct. of our coal is bought on the ash clause basis.

Any allowance is calculated on the excess average ash content for the month, on the monthly tonnage, at the contract price. The following is information on allowances received:

December, 1922	Received credit note from 1 colliery
January, 1923	,, ,, ,, ,, 5 collieries
February, 1923	,, ,, ,, ,, 4 ,,
March, 1923	,, ,, ,, ,, 4 ,,
April, 1923	,, ,, ,, ,, 3 ,,
May, 1923	,, ,, ,, ,, 1 colliery
June, 1923, to April, 1924	,, ,, ,, ,, 3 collieries
May, 1924	,, ,, ,, ,, 2 ,,
June, 1924, to October, 1924	,, ,, ,, ,, 1 colliery

The last claim was in October, 1924. Since then the averages of tests have been below contract restriction.

In conclusion, I should like to thank my Chief, Mr. P. G. Winstanley, Engineer and Manager of the Wolverhampton Gas Company, for his kindness in allowing me to publish the results given.

Discussion.

The Chairman said the paper had been most interesting, particularly to those on the works side. It seemed to him that the yield of ammoniacal liquor might have been better, though the thermal yield was excellent. He felt that a water softening plant would have been preferable to the colloidal treatment. He thought the purchase of coal on an ash-clause basis was excellent; and particulars of the agreed sampling methods would be of great interest.

Mr. C. F. Tooby (Coventry) moved a vote of thanks to Mr. Macnaughton for his paper. He (the speaker) had been to Wolverhampton, had seen the reconstruction works in progress, and was thus able to appreciate the difficulties which had been overcome in making modern works from the existing plant. The results obtained were very good. The ammoniacal liquor return was, however, low for vertical retorts. He would like to know which the author preferred—five or seven ton retorts. A temperature of 1400° C. seemed rather high for the retort walls. What was the strength of the liquor made? Had any trouble been experienced due to corrosion in the waste-heat boiler? Were the concrete purifiers satisfactory, and what methods were adopted to ensure gas tightness?

Mr. H. R. Hems (Birmingham), seconding the resolution, said that the question of insulation was coming to the fore, and for continuous working and long-period furnace installation, more attention should be paid to the prevention of heat loss.

Mr. Harry Clark (Derby) inquired, in view of the demand for gas for cooking, what was the average cooking pressure during the week, and the maximum on Sundays.

Dr. E. W. Smith (London) congratulated the author upon his paper. With the development of the gas industry, they were getting more elaborate and more scientific plants; and it was a matter for satisfaction that among the men were those who were able adequately and efficiently to deal with these plants. Mr. Winstanley was to be congratulated upon his public spirit in allowing so much detail to be published. He (the speaker) was sure it would be to the industry's advantage. It was a matter for satisfaction that such progressive work was being done at Wolverhampton in regard to coal buying on an ash basis. He had not seen anything of the kind before published by a British gas engineer. He would like to know if it cost more to buy upon that basis. The use of the waste-heat boilers was a matter of interest. They saved ground space, and worked at high efficiency. The steam was apparently much in excess of the guaranteed figure. He thought it would be well to test what was the effect of lining inside the tubes; it occurred to him that this might reduce the steam produced by 10 p.ct., but much would depend upon velocity, and other considerations. The prevention of corrosion was, of course, important. He would like to know what the CO_2 content averaged at the inlet of the boilers. Did they quench the coke by steam or water? Steam quenching, with the water turned off completely, but with an emergency supply, was of considerable advantage. He would like to know whether Wolverhampton dealt with their own ammoniacal liquor. Did they experience any trouble with their effluents? There were, he reminded them, means of eliminating this difficulty by adopting measures incorporating the principles laid down by Dr. Bailey. In some instances interesting results were being obtained. He had seen it reported that tar distillers had objected to Corporations mixing bitumen with tar. When was this sort of thing coming to an end, if people who depended upon the gas industry were going to differentiate between corporations and companies? With regard to the temperature of 1400° C. being dangerous, everything depended upon the nature of the material. A number of plants were working safely at 1450° C. It would be interesting if someone who had got verticals, and was in a position to make a comparison, would show what the disadvantages of verticals were as compared with the horizontals. Most progressive undertakings were putting in verticals of one kind or another; but one did hear of gas engineers who were doubtful whether this type of plant was the right thing to instal. It would be a good thing if a gas engineer who had gone over to horizontals would give a really first-class comparison, under similar conditions, of the costs of production of therms in verticals and horizontals.

Mr. W. J. Pickering (Coal Test Plant, Nechells) described the yield of tar from the 7-ton retorts as good; but he would like to know if it were calculated on a wet basis. What was the approximate water content of the tar? He regarded the fuel figure as exceptionally good. He would like to know the amount of volatile matter in the coke, also the CO_2 content and the nitrogen content of the gas made. The calorific value of the gas approximated to the quality to which they worked in Birmingham.

Mr. C. F. W. Rendle (Redditch) said he was much interested in the waste-heat boiler, and was surprised with the good results obtained by the adoption of one of the mysterious forms of water treatment. The coke consumption figure was remarkably low; and he took it that this was due to some extent to the care exercised in insulating the settings, which with verticals could be accomplished more economically than with horizontals.

Mr. L. H. Thomas observed that he had experience of both horizontals and verticals, and could hardly imagine engineers preferring to revert to horizontals. Perhaps, however, local conditions might affect the position. He thought verticals were superior.

Mr. Silvester (West Bromwich) asked what was the strength of the ammoniacal liquor from the verticals. They had tried steam quenching at West Bromwich, with the water off. The appearance of the coke seemed better. Was any trouble experienced with deposit in the retort-house governors?

Mr. S. K. Hawthorn (Birmingham) observed that there was only one boiler and one feed pump. Did that mean that if the latter went wrong the boiler had to be shut-down?

Mr. Macnaughton, in reply, said that they were disappointed with the ammonia yield. They increased the number of jets to four, but the yield was low. He agreed as to the value of softening plant, but as their works were small, they decided to try "Algor." Benzole washing was still carried out, and they were making a small profit upon it. As to coal sampling, they had no sampling machine. The strength of the ammoniacal liquor was 8·6 oz. No trouble was experienced with corrosion in the tubes of the waste-heat boiler. As to the retorts, there was now practically no difference in the working of the 5 and the 7 tonners. The concrete purifiers were absolutely gastight. They used a super-cement, and no trouble was experienced. The working pressure was 65 tenths. They were making a

lot of experiments on Dr. Bailey's principles as to the treatment of effluent. Regarding coal cost, he did not think it was any more than at any other place. Steam quenching was adopted. The tar yield was on the wet basis. The fuel figure compared, he thought, with other installations of the same type as at Wolverhampton. The volatile matter in the coke was 1·0 to 1·3 p.ct. As to the retorts, there was no auxiliary supply of air. As to deposits in the retort-house governor, trouble was experienced at the governor outlet, but this ceased after putting a spray at the inlet and the outlet. The boiler would be stopped if the pump went wrong.

REPORT OF THE ROYAL COMMISSION ON THE COAL INDUSTRY.

(*Concluded from p.* 685.)

In our outline of Parts I. and II. of the Report (*ante* p. 683), we concluded by mentioning the proposal that local authorities should be empowered to engage in the retail sale of coal. Having discussed the question of distribution, the Report goes on to consider the conveyance of coal, and states that the general saving in railway operating which might be expected if 20-ton wagons were substituted for those now in use should be estimated. The railway companies, it is suggested, should allow rebate in rates corresponding to the greater part of this saving, retaining for their own benefit the minor portion.

A similar estimate should be made of the saving in railway operating that would ensue if large combinations were effected of collieries and other wagon owners, who would consent to being supplied with wagons from a district pool. It is suggested also that power should be conferred on the proper Department of Government to make any necessary regulations based on the recommendations of a Standing Committee on Mineral Transport (which it is recommended that the Ministry of Transport and the Mines Department should establish) for the standardization of wagons. This Committee should be required to make an annual progress report to Parliament.

EMPLOYERS AND EMPLOYED.

Part III. gives the Commission's general observations on this question. Regarding statistics relating to the yearly output of coal per head of all persons employed, it is stated that these constitute no proof whatever of declining efficiency or industry on the part of the men. The miner is only one factor in the production of coal. The output depends on two other factors, often of greater importance—the physical conditions of the mine and the efficiency of management. The fact that the average yearly output for each person employed in mining is in Britain less than one-third of what it is in America, and 50 p.ct. more than it is in France or Belgium, is no ground at all for thinking either that the British miner is personally less efficient than the American, or that he is personally more efficient than the Belgian or French one. Physical conditions and the organization of mining in the various countries are not comparable.

The output per person employed is found to vary widely, not only from one country to another, but, within each country, from one district to another and from pit to pit. As to the possibilities of increasing output, the Commission say that returns made to them show a difference of about 3 cwt. per man-shift between the smallest class of undertaking, each producing less than 200,000 tons a year, and the large concerns producing 1,000,000 tons and upwards. If all undertakings could come up to the level of efficiency of the large ones, the problem of restoring prosperity to the industry would be a long way towards a solution. Comparing the conditions of the industry in 1913 with those which exist to-day, it is stated that now seven men are endeavouring to live in mining off the same total output as six did before the war, and are claiming to live as well. They can do so only if the price of coal has risen at least one-sixth more than all other articles; and it has not done so. This gap must be filled by a marked rise of coal prices, by better organization leading to greater output, or by acceptance of a lower standard of living.

COKE OVENS AND SELLING AGENCIES.

The Miners' Federation suggested to the Commission that the profits of undertakings associated with collieries, who are obtaining proceeds from the coal by carbonizing it, selling it, and transporting it, should be brought into account for the wage ascertainment of the coal miners. The argument was put forward most strongly in relation to the coke and bye-products plants. These, it was urged definitely by the Federation, should be treated as part of the mining industry. Against this idea the employers put forward the view that coking was an absolutely distinct industry, with its own finance and wage arrangements. This point, the Commission mention, was weighed by Sir William Plender when considering the 1921 wages agreement; and it was ruled by him that the only proceeds to be taken into account were those of coal mining proper. Coking and bye-products businesses were excluded. This appears to the Commission to be a right decision; for, they state, the conditions of mining and of coking differ fundamentally in respect of the proportion that wages bear to the total costs of production. Any direct inclusion of coking labour with mining, at the same ratio of division of net proceeds, would, they affirm, be manifestly absurd. With regard to selling agencies connected with collieries, it also appears to the Commission that the profits of these agencies should in general be included as proceeds in the ascertainment. It is sometimes argued that the colliery, in view of its assured market, may reasonably take a lower price from an associated undertaking. The Commission doubt if this argument is admissible. The Report mentions that Mr. Evan Williams, in his evidence, agreed to the suggestion that a business buying coal ought not to get it more cheaply from an associated than from an independent colliery. This means that the colliery should reap the economies, if in direct association with its customers. The Commission accept Mr. Williams' assurance that the desire of the Mining Association is that the benefit of any doubt should be given in favour of the miners' wages, and not against them.

SHARES FOR WORKMEN.

It is suggested that, by suitable legislation, colliery undertakings generally should be required within a definite period to adopt schemes providing that, of all profits distributed above a standard dividend on the existing capital, a fixed proportion should be reserved as shares to be issued to employees, having regard to the service rendered by them.

SMALL MINES.

The difficulty due to wages going by districts and profits by mines has another aspect and leads to the following suggestion:

> The existence of the less successful mines in a district, by lowering net proceeds, lowers wage rates, and so increases the profits of the more successful mines in that district. For a number of reasons it is well worthy of consideration whether there should not be some exclusion from the wage ascertainment of those classes of mines which, as a whole, are unsuccessful. This means that they would have to pay the district wages, but that their working results would not be taken into account in fixing the wages. The wage rate for the district should be set by the most efficient employers in it, and not be depressed by the less efficient. The result might be to hasten a little, as it is desirable to hasten, the closing of uneconomic mines.

CONCLUSIONS REGARDING WAGES.

At the end of the Commission's survey of this problem, the following main conclusions are set out:

> First, the wage agreements of 1921 and 1924 embody two principles of essential value, both of which should be preserved: That of an economic wage determined from time to time on ascertained facts as to the economic condition of the industry in each district, and that of a minimum wage settled for each district on principles approved nationally.
>
> Second, the satisfactory working of these agreements in respect of the economic wage has been hindered by several difficulties, of which the chief is that relating to transfer prices on sales under associated conditions; a radical change of methods for ascertaining these prices is in our view essential. Almost equally important are other changes which we propose, for giving workmen a share in the distributed profits of individual mines; for excluding from the wage-ascertainment the smaller undertakings; for postponing recoupment of excess payments by the mine owners. To these we add minor suggestions for inclusion of subsistence allowances in wages costs rather than in other costs; as to the treatment of amortization charges, and directors' fees; for extension of piecework payment, and other matters.
>
> Third, a minimum wage is necessary, both in the form of a subsistence wage guaranteeing so many shillings at least per shift to even the lowest paid workman, whatever his basis rate or percentage addition, and in the form of a minimum percentage guaranteed to every man on his basis rates; but the present subsistence wages and the minimum percentages call for reconsideration district by district. A satisfactory subsistence wage system pre-supposes a family allowance system. The fixing of a uniform minimum percentage for every district with reference to a single standard year, chosen arbitrarily, like 1914, produces indefensible anomalies.
>
> Fourth, apart from district anomalies, the minimum wage since 1924 has been fixed so high relatively to the economic ability of the districts as practically to obliterate and replace the economic wage; to a large extent it did so even between 1921 and 1924. . . . While mining wages are even now lower than we desire and hope to see them, we cannot, comparing them either with those of other great industries exposed to world competition or with pre-war wages, regard any decline from the present minimum percentage as in itself indefensible.
>
> Fifth, irrespective of the level of wages, we regard the introduction of a system of children's allowances—to be paid for out of a single pool, either for the whole industry or for each district that adopts it—as one of the most valuable measures that can be

adopted for adding to the well-being and contentment of the mining population.

Sixth, the machinery of wage regulation, in the future as in the past, should provide for all the elements that have to be considered in fixing wages. There should be no abandoning of the principle of national wage agreements. There may be advantage, if the two parties agree, in having a National Wages Board, which shall bring in also impartial elements outside the coal industry itself.

Seventh . . . the differences in the present remuneration of labour of comparable degrees of skill, responsibility, and risk in different industries are notable, and suggest the need for some reference to general standards when the wages of any particular class are under consideration.

Working Hours.

The Commission do not recommend the acceptance of the main proposal of the Mining Association for a return to the 8½ hour day. The suggestion is made that existing regulations should be made more flexible, and that it should be considered whether the definition of working time by the day rather than by the week is everywhere essential. It might be possible and beneficial, at least in certain districts, to allow the daily limit to be 8 hours, or even more, so long as the total of 42 hours, *plus* one winding daily, was not exceeded in the week as a whole. Evidence showed that in many cases a 5-day week of 8 hours per day, making 40 in all, would be more productive than a 6-day week of 7 hours per day, making 42 in all. It appears reasonable that, if the State step in to limit the time which any individual man may be required to spend below ground, no obstruction should be placed in the way of the fullest possible use of the mines and the national resources by the employment of double shifts of men.

Concluding their remarks on the question of hours, the Commission do not recommend the State, of its own motion, to make any change of working hours, or to endeavour to force upon the miners a longer working day than at present. It is added that this does not mean that if employers and workmen were agreed in proposing a change, the State should refuse to accede to their joint request.

Holidays with Pay.

Though there has been during recent years a progressive reduction in the rate of avoidable absenteeism, the Commission consider that a serious effort should be made to reduce it further. Such an effort would be stimulated by profit-sharing arrangements. It would be stimulated more directly, and perhaps more effectively, if the mining industry could rank itself with others in which regular annual holidays with pay have become the custom. This is what they have to say on the matter:

> No industry needs such a holiday system more than the mining industry, with its predominantly underground employment. But in an industry where the labour costs are so high in proportion to the total costs of production, the economic charge would be much heavier than in others. We cannot expect that this additional burden should be accepted by the industry as a whole in its present economic condition. Some of the more profitable mines may be in a position to make this concession, which would be greatly appreciated by the men. When more prosperous times return, the custom may spread throughout the industry. The cost would be largely recouped through the better organization of production made possible by the decreased absenteeism that may be expected to follow. The holidays with pay would, of course, be conditional in each individual case upon a reasonable regularity of attendance during the preceding period.

Personnel of the Industry.

A section of the Report is devoted to a consideration of the personnel of the industry. They emphasize the amount of movement which takes place in the labour employed, and stress the importance of taking some steps to direct and organize this movement from one mine to another or one district to another. It is important, they state, that the industry should not unnecessarily recruit labour from outside, and mention that no arrangements are in force at present for securing this end. They recommend that owners and miners should confer together, either nationally or by districts, with a view to considering, in conjunction with the Ministry of Labour, steps for securing the transfer of unemployed miners from one district to another, and for giving such miners the first chance of obtaining such colliery employment, in preference to the recruiting of outside labour.

Safety and Health.

The Report considers at length the safety and health of those employed in the industry, and admits that coal mining is among the most dangerous of occupations. The following are the main conclusions in this section:

> Mining has always been an exceptionally dangerous occupation.
>
> The death rate due to explosions and winding accidents shows a striking decrease in the last half century, and is at the present time of small proportions.
>
> The death rate from falls of ground, haulage accidents, and miscellaneous causes shows some decline, but a comparatively small one.
>
> The returns of minor accidents show an increase. In view of the large decline in the rates of fatal and serious accidents, we cannot conclude, from the increase in minor accidents alone, that the mines have become more dangerous.
>
> There is an excessive prevalence of nystagmus among miners. This is chiefly due, in the opinion of the special Committee of the Medical Research Council, to insufficient lighting.
>
> There is no evidence to show that, apart from accidents and industrial diseases, mining is not a healthy occupation.
>
> The high accident rate makes the charge for Workmen's Compensation a heavy burden upon the industry, amounting to over £3,000,000 a year, or 3d. per ton of coal produced. It is obviously to the interest, as well as being the duty, of the industry to take all practicable measures to reduce the very heavy accident rate.

Welfare.

For the provision of baths, the Commission propose an additional charge of 5 p.ct. upon royalties, averaging ¼d. per ton, to be paid into the Welfare Fund. The yield will be about £250,000 a year. The more prosperous collieries, it is suggested, may be ready to defray a part of the remaining cost, as well as to provide the land required. The provision of any balance that may be needed should be considered by the Committee of the Welfare Fund in the same way as are other demands upon their resources. The Committee should be asked to impose upon the districts, as a condition of this increase in their revenue, the duty of encouraging the rapid provision of pithead baths at all collieries with a probable life of not less than 15 years.

Conclusions.

Part 4 concludes the report, and deals with the present situation. The first dominating item is that in the last quarter of 1925, if the subsidy be excluded, 73 p.ct. of the coal was produced at a loss.

The essential facts of the present situation are these:

> Compared with the pre-war period, the home demand for coal is stationary. Economies in the methods of burning coal combined with depression in the iron and steel and ship-building trades have counter-balanced the effects of growth of population and of industrial progress.
>
> The foreign demand was 7⅛ p.ct. less in 1924 than in 1909-13. In 1925 it was 22 p.ct. less. There has been in 1925 a serious depression in the industry in almost all the coal-producing countries of Europe. The principal causes are: The depressed condition of a number of staple industries in many parts of the Continent, and the almost complete cessation in the demand for imported coal in Russia; the increased use of oil for shipping; the large increase in the output of lignite in Germany; and the working of new or extended coalfields in certain Continental countries.
>
> A great new coalfield has been developed in South Yorkshire and Nottinghamshire. From this field about 11 million tons a year are now being produced, and before long the production will be 20 million tons.
>
> With a stationary demand at home and a reduced demand abroad, the number of men employed in the coal mines of Great Britain has increased from an average of 1,048,000 in 1909-13 to 1,156,000 in 1925, or by more than 10 p.ct.
>
> In 1923 the occupation of the Ruhr disorganized the working of a coalfield, of which the output in normal times is equal to more than a third of that of Great Britain. The consequence was that pits were opened or kept open here; profits were high; the wage agreement between the employers and the miners was revised, 11 p.ct. being added to the minimum rates of pay. By the summer of 1924, normal conditions had been restored in the Ruhr. In the first half of 1925, the coal industry of Great Britain suffered the full force of the depression which had previously been impending. Prices collapsed, and the industry, taken as a whole, ceased to be remunerative.
>
> From the beginning of the subsidy period until Dec. 31, 1925, the subsidy averaged over 2s. 6d. on the ton of coal, or about 17 p.ct. of the pithead price. In the last three months of the year it was 3s. per ton, and it enabled the collieries to show in that period an average profit of 1s. 6d. per ton, and wages to be maintained, while prices generally were somewhat reduced.

The Policy of Subsidy.

The Commission recommend that the subsidy should not be continued, for in their view the principle is entirely wrong. Few will disagree with this.

It has been suggested that, since the present difficulties are due very largely to the shrinkage in our coal exports, a subsidy should be continued, limited to that branch of the trade. This the Commission do not recommend. In the first place, it would have the effect of lowering the price of the British coal that was bought by the iron and steel works of France, Germany, Belgium, and other countries, while leaving the home price the same. It would in effect give them a bounty, at the expense of the British taxpayer, to assist them in their competition with the British iron and steel trade in the markets of the world. In the second place, it is possible that the measure would be met by similar measures on the part of Germany, the principal competitor of our coal industry. Each of the two countries would then have imposed an additional charge on its budget, while their relative positions would remain at the end what they had been at the beginning.

Revision of Minimum Percentage.

The Commission see no escape from the giving up of the

minimum of 1924. This does not mean simply a return to the minimum of 1921—*i.e.*, a uniform reduction of 10 p.ct. on the present minimum percentage. In some districts less may be needed; in others more. It will be for the mine-owners and the miners to carry out by negotiation the necessary downward revision of district minima.

SUGGESTIONS FOR MEETING THE SITUATION.

The Commission's suggestions for meeting the present situation are as follows:

Before any sacrifices are asked from those engaged in the industry, it shall be definitely agreed between them that all practicable means for improving its organization and increasing its efficiency should be adopted, as speedily as the circumstances in each case allow.

The owners should discontinue charging the miners as a body with deliberate attempts to destroy the prosperity of the industry, in order to compel its nationalization. It is possible that there may be a small number of individuals here and there who are animated by this idea; but we are convinced that the point is without substance.

The owners should also cease to countenance accusations against the miners of restriction of output.

The miners on their part should cease to attach exaggerated weight to losses of output due to failures of the management to provide the colliers with proper supplies of tubs, rails, timber, or other requisites.

The mine-owners should not refuse to engage in discussions on a national footing with the Miners' Federation of Great Britain. All the principal industries of the country conduct negotiations between employers and employed on a national basis; and we can see no reason why the mining industry should be an exception. At the same time, the conditions imperatively require that there should be a large degree of flexibility in the wage rates of the different districts. The Miners' Federation should recognize this, without detriment to the broad policy that the general principles should be laid down nationally.

As the first step to the making of a new wage agreement, the Mining Association and the Miners' Federation should meet nationally.

CLOSING OF SOME COLLIERIES.

Whatever the course that may be taken in these and other matters, it seems to be inevitable that a certain number of collieries must be closed in the immediate future. In view of the state of demand at home and abroad, together with the developments in South Yorkshire and Nottinghamshire, the industry, in the other districts, is too large in size for the requirements it has to fulfil. Under nationalization precisely the same situation would present itself.

It appears to the Commissioners that there is no demand for British miners in the Dominions, though many of them might make useful agriculturists, and would be welcomed there in that capacity. They regard it as a matter of much importance that, should the occasion arise after the discontinuance of the subsidy, the Government should be ready to take all practicable measures for the assistance of any labour that may be displaced, or for facilitating its transfer, and should provide such funds as might be required for those purposes. This is the final statement of the Report, to which there are nine annexes.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

Pressure for Maximum Efficiency.

SIR,—In my letter which you were good enough to publish in your issue for March 10, the following questions, among others, were involved:

1. Why should CO_2 be added, if only in small quantity, to a combustible gas by a chemist, particularly when O_2 could be added with equal ease?
2. Why is 60 in. pressure at the nipple of a lighting burner necessary for maximum efficiency in the case of 500 to 560 B.Th.U. gas?
3. Why is only 3 in. pressure (or less) supplied to (say) gas-fire burners with 500 to 560 B.Th.U. gas?
4. Why is the gas industry satisfied with 70 to 80 therms per ton of good coal with coke, if 250 therms per ton of coal without coke are obtainable in just as serviceable a gas?

I submit that these are most important questions; and I trust some one will be found to answer them.

GEO. HELPS.

Nuneaton Gas Company,
March 19, 1926.

Fuel Technology and the Society of Chemical Industry.

SIR,—I have been requested by the Council of the Society of Chemical Industry to place before the readers of your "JOURNAL" certain proposals relating to the establishment of a Fuel Section within the Society.

I would like to point out that for many years it has been the privilege and the function of the Society of Chemical Industry to provide platforms in all parts of the country for the discussion of the scientific and other aspects of fuel technology. A Committee which was formed in 1924 undertook the organization of meetings for this purpose. The original Committee consisted of Mr. Garland, Dr. Lander, Dr. E. W. Smith, Mr. Talbot, and myself. The meeting at Leeds in July, under the Chairmanship of Prof. Cobb and Sir Arthur Duckham, and the Coke Symposium at Sheffield in November under Sir Frederick Nathan, are examples of its activities. Special papers on fuel technology are to be presented at the annual meeting of the Society in London this year, and a further symposium upon the subject of coal tar is being arranged for October.

The interest in fuel problems now awakened is indicated, among other things, by the proposed formation of a new Institution of Fuel Technology, which from its genesis appears likely to draw its membership largely from the engineering, electrical, and commercial sides; but it is felt that industry in general will continue to look to the Society of Chemical Industry for the development on scientific lines of the principles and practice of fuel technology which is more than anything else demanded for the better utilization of the country's fuel resources.

It has, therefore, been decided that the existing Committee, which has already done such valuable work, shall be enlarged and placed in charge of a Fuel Section which shall be established within the Society, and shall be devoted to the development of the application of scientific principles to the study of fuel technology. The Section will be open to any member of the Society who pays a registration fee of 5s. per annum; and the Committee with its own Chairman and Secretary has been appointed. The Section will take over the work of the Joint Committee of the Society and other bodies which organized the recent conferences at Leeds and Sheffield, and will do everything possible to strengthen the existing work of the Society in connection with fuel technology. This will be done principally by the organization of adequate treatment of fuel subjects at the local sections; notices, and wherever possible an advance copy of all papers upon such matters to be read before any section of the Society, will be sent to members of the Fuel Section. The reports and transactions of the Section will not be published separately as in the case of the Chemical Engineering Group; but the Council of the Society will undertake that all papers upon fuel technology worthy of publication shall have adequate space allowed to them in the "Transactions" of the Society. Further, the abstracts relating to fuel technology will be materially extended.

It is felt that the formation of such a Section will co-ordinate the work of chemists and other workers engaged on fuel problems, and will secure widespread and effective discussion of that work. In order to prevent overlapping, and to enable the subject to be dealt with in as comprehensive a manner as possible, it is hoped that co-operation with other Institutions by means of joint meetings and in other ways may be arranged.

The members of the Committee are Prof. W. A. Bone, Prof. J. W. Cobb, Mr. E. V. Evans, Mr. C. S. Garland, Dr. C. H. Lander, Mr. McCullock, Mr. W. J. U. Woolcock. The Chairman of the Section is Prof. Arthur Smithells, F.R.S.; and the Joint Honorary Secretaries are Dr. E. W. Smith and Mr. H. Talbot, to whom all contributions should be addressed at Central House, Finsbury Square, E.C. 2.

W. J. U. WOOLCOCK,
President of the Society of Chemical Industry.

March 17, 1926.

[Upon the subject of this letter, a comment appears in our Editorial columns.—ED., "G.J."]

Successful Year at Dewsbury.—The abstract of accounts of the Dewsbury Corporation for the year 1924-25 reveals the satisfactory working of the Gas Department, for which tribute is paid to the Engineer and Manager (Mr. Henry L. Bateman) by the local Press. There was a gross profit of £20,703, and a net profit of £6997, which was used towards liquidating an existing deficit. The income from the sale of gas was increased £5744, while the cost of manufacture was decreased by £1340, and of distribution by £1143. In spite of the general fall in the value of residual products, the income from this source declined by only £83. In spite of the extra gas made and sold, the cost of coal was £700 lower than in the preceding year.

Experiments at Salford.—With a view to dealing with the smoke evil, the Salford Health Committee are making provision for the consumption of gas or electricity in the dwellings that are now being erected on the Littleton Road Estate. The Committee will visit a block of completed flats and houses in which gas and electricity have been installed for lighting, heating, and cooking purposes. The hot water will depend upon either gas or electric power. After tests have been carried out, a decision will be made whether gas or electricity is to be fitted in the 64 flats and 62 houses which comprise the last building scheme. When completed, the Littleton Road Estate will have 505 dwellings, leaving 158 to complete the fourth and final scheme in this district.

REGISTER OF PATENTS.

Tankless Gasholders.—No. 244,089.

PAUL LECHLER (Firm of), of Stuttgart.

No. 30,343; Dec. 1, 1925. Convention date, Dec. 8, 1924.

The invention has for its object to provide an improved sealing material for the annular bearing between the piston and the internal wall of a "dry" gasholder.

The patentees point out that high-temperature coal tar and its distillates for sealing are subject to a number of serious faults. High-temperature coal tar thickens in use very quickly, partly by polymerization, partly also from the fact that constituents are carried away by the stored gas. Owing to the thickening, the power for operating the pumps has to be increased. The pumps are generally electrically operated, and come into action automatically as required. In the event of overloads on the electric motors, the fuses blow; and if this is not soon noticed, the seal suffers and leads to losses of gas, apart from the danger associated therewith. Further, the most valuable parts of the tar are uselessly lost in the carburetting of the gas, and must be again replaced by just these valuable parts, which considerably increases the operating costs. Further, a thickened tar shows a raised setting point in relation to the original thin liquid, which in winter time may constitute a serious defect.

Another shortcoming may be mentioned—that the water deposited from the gas is suspended as an emulsion in the coal tar. These emulsions are so stubborn that, for example, even after four months' use it has been possible to find water contents up to 20 p.ct. in the tar. This water again raises the setting point of the tar, and, moreover, causes corrosion of the holder wall

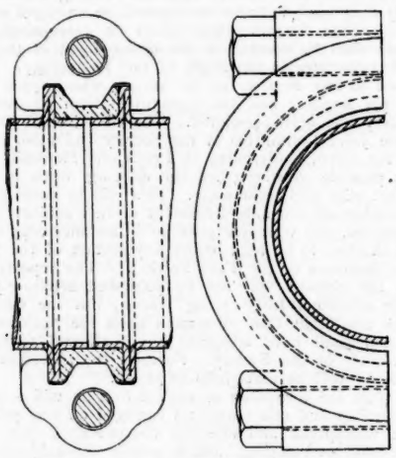
These difficulties, the patentees claim, can be avoided by the use of a solution of bitumen, excluding high-temperature coal tar pitch, in high-boiling, low-setting, high flash-point, non-vaporizable mineral oils, such as lignite tar oils and low-temperature tar oils.

Joints for Pipes, &c.—No. 246,699.

STEWARTS & LLOYDS, LTD., of Glasgow, CARSON, J., and LIDDLE, G., both of Coatbridge.

No. 9647; April 14, 1925.

This invention relates to joints for pipes and other fluid conveyors or containers; its object being to provide a joint therefor which shall be fluid-sealed and leak-proof when under internal or external pressure or under a vacuum either internally or externally.



Flexible-Ring Joint.—Stewarts and Lloyds, Ltd.

As will be understood from the drawings reproduced, the joint comprises a flexible packing ring having a mid portion adapted to cover over and press against the abutting ends of the pipes, and side portions or flanges adapted to press against collars or flanges on the pipes. The packing is held in place round the junction of the pipes by a housing which is made so as to press on the mild portion and hold it tightly over the junction and also to press the flanges against the collars.

Gas Meters.—No. 247,732.

THORP, F., and PARKINSON AND W. & B. COWAN, LTD., both of Kennington Road, S.E. 11.

No. 3188; Feb. 4, 1925.

This invention relates to gas and like meters, and has for its object to provide improved and simplified means for adapting the meter to be operated as a prepayment meter by coins of differing values and dimensions or as an ordinary meter without prepayment. The said means are of the type wherein the shaft operated by the metering mechanism may have imparted thereto a relative movement between its ends for gear changing purposes.

The claims include: "The combination comprising a plurality of worm wheels, a pinion between said wheels, a worm or worms mounted on a shaft operated by the metering mechanism, and means imparting a relative movement between the ends of said shaft for engaging and disengaging said worm or worms and said wheels. And the combination comprising a plurality of worm wheels, a worm or worms mounted on a shaft operated by the metering mechanism, a bearing plate or bracket for one end of said shaft, and a positioning peg and clamping device whereby said plate may be secured in three positions."

Gas Manufacture.—No. 246,970.

HUMPHREYS & GLASGOW, LTD., and STELFOX, J. C., both of Victoria Street, S.W. 1.

No. 30,255; Dec. 16, 1924.

This invention has reference to the manufacture of gas by the known process in which coal or like material is carbonized in the upper part of a generator and passes as coke into the lower part thereof, where it is alternately blasted with air to raise its temperature and with steam to produce water gas, which is passed through the coal above to carbonize or assist in carbonizing it. The object of the invention is to enable the process to be carried out efficiently as regards the transfer and utilization of heat for the production of water gas and the carbonization of the coal, and to enable the mixed gas produced by completely gasifying the coal to be enriched when necessary without employing special or additional recuperators, carburetters, or the like.

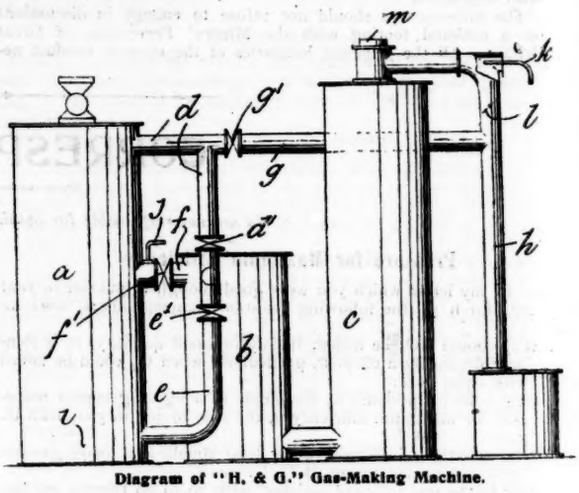


Diagram of "H. & G." Gas-Making Machine.

To this end, according to the present invention, the coke is blasted with air; and the blast gases are led off from the coke without passing through the coal, and are utilized to heat recuperative chambers. The coal is carbonized partly by the passage through it (in a counter current direction with reference to the travel of the fuel through the carbonizing and gasifying chambers) of the following: Hot water gas and excess steam produced by steaming the coke with steam superheated in the recuperative chambers, a portion of the produced coal gas and water gas mixed and superheated with the fresh gas-making steam, and hot water gas produced by steaming the coke with "saturated" steam.

The lengths of the superheated and "saturated" steaming periods may be so adjusted as to provide the time for the requisite degree of carburetting in the recuperative chambers when not using these for the superheating of the steam. If desired, down-running may be employed with "saturated" steam introduced at the junction of the coal and coke chambers; and during this period carburetting also may be carried out or continued. The term "saturated" steam is intended to mean and include (as well as steam direct from the boilers) steam which has not been superheated in the recuperative chambers; but it is immaterial whether such steam has been more or less superheated by other means—for instance, in a steam-boiler superheater or the like.

As will be understood, air blasting of the fuel may be effected between the superheated and the "saturated" steaming.

During the latter part of the blow, the blast gases may be passed through the coal, thereby helping to carbonize it; and these gases, which will be comparatively rich in carbon monoxide, and the gases evolved from the coal may be led off without passing through the recuperative chambers and stored together with the water gas, if desired.

Under some conditions the utilization for carbonization of a portion of the coal gas and water gas mixed and superheated with the fresh gas-making steam may be suspended or dispensed with; the heat conditions in the generator being maintained, if necessary, by using a greater quantity of steam during the superheated steam run periods, or of air during the blasting periods, or of steam and of air respectively during such periods.

Apparatus for carrying out the process is indicated in a diagrammatic drawing (reproduced herewith). There are a generator *a* formed with a gasifying portion and a carbonizing portion above it, a recuperative chamber or chambers—say, a carburetter *b* and superheater *c* of suitable type—valved connecting passages *d*, *e*, and *f* between a recuperative chamber—say, the carburetter—and the top, bottom, and intermediate portions of the generator respectively, and a valved connecting passage *g* between the top of the generator (by

way of the passage *d*) and the outlet *h* from the recuperative chambers to storage; d^1, e^1, f^1, and g^1 indicating the valves in the connecting passages. Steam inlets *i*, *j*, *k* are provided at the bottom of the generator, at the junction of the gasifying and carbonizing portions and in the outlet from the recuperative chambers to storage; a regulating valve *l* being interposed between the gas connection *g* with the top of the generator and the steam inlet *k*, which is adapted to induce a backward flow through the recuperative chambers. This steam inlet may be located at some point nearer the generator, if desired. The usual connections are provided for the air blast to the fuel bed and for secondary combustion of blast products, but these are not shown.

Some of the valves may be coupled so as to be operated simultaneously; or they may be interlocked in any convenient way. One arrangement is described in connection with a more detailed drawing; and the invention is fully set out and covered by eight claims.

Washers.—No. 246,978.

KIRKHAM, HULETT, & CHANDLER, LTD., and HERSEY, S., both of Norfolk Street, W.C. 2.

No. 222; Jan. 3, 1925.

Gas washers as commonly constructed consist of a series of superposed chambers; each containing a revolving apparatus for spraying the water or other cleansing liquid so that it is projected radially across the chambers and comes into intimate contact with the ascending gas. One form of spraying device comprises a number of concentric cones, the lower narrower ends of which dip into the liquid contained in the bottom of the chambers, and on their rotation cause the liquid to pass up through the narrow annular spaces between the cones; the liquid on reaching the upper ends of the latter being projected by centrifugal action transversely across the chambers.

This invention provides for a spraying device which consists of a series of concentric inverted cones, as above described, the depth of which decreases from the innermost to the outermost. The upper rim of each of the cones is perforated or furnished with slits or slots or the equivalent for a convenient depth, such that, when the cones are rotated in the usual manner, the ascending liquid is delivered through the perforations; a spray of a relatively considerable depth, whereby the efficiency of the apparatus is increased.

The upper ends of the cones may be inclined inwards so that they assume a vertical position. By these means the spraying portions of the cones rotate at approximately the same peripheral speed.

Furthermore, the cones may be furnished with interior spiral vanes or the like for the purpose of increasing their lifting capacity and thereby reducing the number of cones required for a given output.

Detail drawings accompany the specification.

APPLICATIONS FOR PATENTS.

[Extracted from the "Official Journal" for March 17.]

Nos. 6340-7079.

BEARD, G. F. H.—"Gasholders, &c." No. 6733.
DIXON, L.—"Gas fires." No. 6898.
FENWICK, A.—"Gas and electric stoves." No. 6344.
HENSHAW, D. M.—"Condensers for recovery of bye-products from carbonization of coal." No. 6811.
LANDIS & GYR SOC. ANON.—"Distant transmission of meter, &c., readings." No. 6954.
LUCAS, F. L.—"Gas fires." No. 6583.
LUCAS, F. L.—"Gas burners." Nos. 6584, 6585.
MANCHESTER FURNACES, LTD.—"Muffle furnaces." No. 6711.
MILBOURNE, R. J.—See Beard, G. F. H. No. 6733.
NEW STIMEX GAS STOVE COMPANY, LTD.—See Dixon, L. No. 6898.
OWENS, J. S.—"Open grate for burning coke." No. 7000.
PERDRISAT, C.—"Apparatus for producing a combustible gas." No. 6724.
SCHROEDER, F. W.—"Incandescent gas burner." No. 6461.
SOC. ANONYME MARIHAYE-D'OUGREE.—"Gas valves." No. 6816.
WILSON, J. H.—"Dry gas meters." No. 7009.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

Progress of Bills.

Newcastle-upon-Tyne Corporation Bill: Read a second time, and committed.

Special Orders.

The Knottingley Gas Order, 1926, was laid before the House, and referred to the Special Orders Committee.

HOUSE OF COMMONS.

Gas Regulation Act.

A copy was presented of a Special Order proposed to be made by the Board of Trade under the Act, on the application of the Knottingley Gas Company.

ASCOT DISTRICT GAS AND ELECTRICITY BILL.

This Bill was before the Unopposed Committee of the House of Lords (presided over by the Lord Chairman, the Earl of Donoughmore) on Tuesday, March 16, and was ordered to await report for third reading.

A proviso has been added with respect to a guarantee by H.M. Treasury for a loan to the Company of £26,000 under the Trade Facilities Act. This provides that, so long as the Treasury remains under any liability in connection with this guarantee, or any moneys due to the Treasury remain unpaid, the interest on any debenture stock created and issued under the powers of the Bill shall rank after the said loan and the securities given by the Company in respect thereof.

LEGAL INTELLIGENCE.

DEVONPORT GAS-WORKS IRREGULARITIES.

Police Court Proceedings.

William Peirson Tervet, late Engineer of the Plymouth Corporation Gas-Works at Devonport, and George Le Bailly, formerly Chief Clerk to the undertaking, appeared at Plymouth Police Court on Thursday, March 18, charged with the theft of various property belonging to the Corporation. Summonses against the two defendants alleged that within the past twelve months they had stolen a table cooker, a geyser, a lavatory set, six mortice locks, six taps, six bags of sand, six bags of cement, 21 lbs. of paint, some lead piping, and a quantity of clinkers; while there was a further summons against Tervet for the theft of wood.

Mr. E. ELLIOT SQUARE (who prosecuted) said the charges against the accused had for some considerable time been a matter of public notice. After a report had been made to the Corporation, a resolution was passed for proceedings to be taken against the accused and any other persons who might be found to have committed offences. The Town Clerk had left the matter entirely in his (Mr. Square's) hands; and the Chief Constable had declined to interfere with the judgment he had formed of the case. Therefore on his shoulders rested the entire responsibility for the charges brought against the accused. The case had been under investigation for some considerable time; and voluminous books, papers, and other documents had been examined. A number of matters which at first appeared to be suspicious had been cleared up. Both the accused were tried and trusted servants of the Corporation, which made things more serious in the eyes of the public and the law. They had—perhaps through a lack of system in their office—been able to commit irregularities, not serious in themselves, which led to a number that, taken together, might be serious. A book was supposed to record the names of all employees at the opening of the works each morning; but there were practically no names checked of men who were late. In an undertaking employing from 150 to 200 men, there should have been something to show that certain employees were not at the works when they should have been; and if the book had been kept in a proper way, it would have been impossible for men employed by the undertaking to be engaged on the private work of the defendants. The evidence would show that for a period of no less than six months one man was engaged on Tervet's work, preparing the garden of a house he had recently purchased, and was paid out of Corporation funds. There also appeared to have been no system of checking goods out of the gas undertaking. At the end of each week the workmen were supposed to fill-in on a time-sheet the work they had done, setting out the purpose for which they had been working. He had before him a number of time-sheets for 1925 relative to a man named Shears, purporting to be signed by him, and showing him to be engaged on maintenance of works during a period when he was on Tervet's private work. Those time-sheets, having been checked by the foreman, had been entered into the wages-sheets at the office. These had been passed on to the Borough Treasurer, and the maintenance of works account of the undertaking had been charged with the wages of that man. In the same way workmen had been employed by Le Bailly at his bungalow; and the charges in respect of this work could only have been made against Corporation funds if both the accused knew about it, and the foremen of the men who filled-in the forms also knew about it and winked their eyes at it. What had been done with regard to those wages and with regard to charging them to the Corporation, in his opinion, amounted to misdemeanours, and undoubtedly were punishable; but there were graver charges, and it was these that were being made against the accused. If the stock-sheets had been properly kept, and proper records made of stock going into the undertaking and out again, these offences could not have been committed. It appeared that if anything was required for the undertaking, whether it was a load of sand or a gas cooker, a requisition form was filled-up and sent to the Committee for approval; and if approved, an order was issued for the article in question to be supplied by the appropriate

department or by the contractor concerned. If the goods were required for any specific piece of work, they were not entered in the stock-sheets at all. If they were received by the gas undertaking as stock, they were taken into the store by the stock-keeper, and he was responsible for them; but if they were received for any specific piece of work, they might possibly be taken into the stock room for safety, but no record of any kind or description was kept of their going in or going out of the works. The result was that a foreman could go to the store-keeper, say he was taking four bags of cement for a particular job, and give him a "chit," which was the only check upon the foreman. There was a store where workmen's tools were kept; but while it had a front door and gate which could be locked, the side had fallen down, and anyone could go in and take anything he wanted. There was no method of keeping a close check upon goods which were not in fact entered in the store-keeper's book. Le Bailly, having a house which was not completely built and furnished, desired to have a table cooker, geyser, and lavatory set, which he charged to the account for maintenance of works. A requisition was signed, "W. P. Tervet, per Le Bailly," and in due course was passed by the Committee, and the goods ordered. These things were fitted at Le Bailly's house at the expense of the Corporation; the men charging for their time as being on maintenance of works. The sand, cement, piping, and paint were also used at Le Bailly's house. In regard to the other charge against Tervet, the accused had a house which he desired to improve by the addition of a verandah; and accordingly he instructed a carpenter, through a foreman, to use certain wood which was Corporation property for the purpose of building it. The value of the wood was not much, 30s. or £2; but he took it and employed Corporation servants for the purpose of turning it into a verandah and erecting it at his house.

Evidence was then given in proof of this opening statement; but no witnesses were called for the defence.

Mr. W. E. J. Major (addressing the Bench on behalf of Le Bailly) said he wished to point out to the Magistrates that what had taken place had only happened within the past nine months; and that Le Bailly had attempted to make restitution of the articles he had obtained from the gas undertaking, having replaced those mentioned in the charges by others of precisely similar value. Mr. Major appealed to the Bench to take into consideration the fact that his client had given 26 years' service to the gas undertaking, and that during the whole of that period until the present time there had been nothing whatever against him. He asked the magistrates to make use of the Probation of First Offenders Act, which was specially designed to meet cases of this nature.

Mr. Isaac Foot (on behalf of Tervet) said that, with regard to his client, there was, apart from the case before the Court, another matter which had been discussed to a considerable extent. In regard to that, Tervet was quite prepared to make his answer when the time came. Therefore the Justices would be fair-minded enough to brush that matter out of their thoughts, and consider simply the charge before them. Tervet had been all his life connected with the gas business—first as a youth at Tottenham, where he was a student in the laboratory until 1902. Then he went to the Plymouth Gas Company, and remained with them for six years. In 1908 he was appointed Engineer and Manager of the Devonport Corporation gas undertaking; and whatever might be said about the administrative system adopted at the works, there was no doubt that under his guidance and direction the concern had greatly grown. The average annual profits had increased from £1000 before the war to over £8000. He had achieved some distinction, and had behind him long and very effective service. Apart from the present charges, not the slightest suggestion was made against him. In every other respect he had a straight, clean, and honourable career. He was now charged with larceny, and it seemed to be beyond any understanding. All that he had done had been done with a surprising openness. The very verandah which was the subject of the charge was made in daylight, taken from the place in daylight, and fixed at his home in daylight. All that could be said was that he had a mistaken sense of what was his and what was not his, and the case pointed to the fact that there was a rigid line to which a man must adhere whatever his position and responsibility. He had advised his client to plead guilty, and asked the Bench to regard this offence, not as a deep design, but a great folly—a tragic indiscretion. There had undoubtedly been irregularities; but he did not think the Magistrates would have regarded them so seriously, had the case not been greatly magnified by publicity. Over the prostrate bodies of the two men political battles had been fought; and they had been used "to point a moral and adorn a tale." Tervet could claim a record of vigilant hard work, week in and week out, year after year, and was proud of his achievements. Against the offences which defendants had committed, the Magistrates should put in the scale their antecedents and characters. Tervet had lived a clean and straightforward life; and this ought to be taken into account in his favour. He urged that the Probation of First Offenders Act was intended to deal with men in these circumstances.

After twenty minutes' absence, the Magistrates returned to Court, and the Chairman stated that they had not been insensible to the eloquent appeal made on behalf of the accused, and to the fact that both of them had lost good positions. On the other hand, they felt that no circumstances which called for special leniency were present in this case. Neither of the accused could plead sudden temptation, for the offences had extended systematically over a long period; neither could plead poverty, for both were amply remunerated; neither could plead ignorance, for they were educated men. Furthermore, both held appointments which from their nature placed them in positions of trust, and both had abused that trust. They would each be sentenced to three months' imprisonment, with hard labour.

Claim against Wareham Electricity Supply Company.

At Bournemouth County Court on Tuesday, Agnes Mond Kerr, 91, Southbourne Road, claimed £75 against the Wareham Electric Supply Company, Ltd., and others; Agnes Eliza Gwinn, Langport, Somerset, claimed £100 against the same defendants; and A. Winifred Parr, Sefton Park, Liverpool, claimed £50 against the Southern Counties Electric Light and Power Supply Company, and others. Mr. George Ainsley (instructed by Messrs. Cohen, Seligman, and Box, London) appeared for the applicants in all three cases. The joint application was that the defendants in each case should not be allowed to defend the actions. He had received an intimation from the solicitors acting for the defendants that they did not intend to be present to oppose the application. An order for discovery was made on Feb. 20. This was served on the defendants on Feb. 21, and it should have been complied with within seven days, but this had not been done. Theobald Magnus Wechstein, Solicitor's Clerk, said that from investigations he had come to the conclusion, and was satisfied, that the Southern Counties Electricity Company and the Wareham Electric Supply Company were not in a prosperous condition, or in a position to pay dividends. None of the plaintiffs had received back any part of the money subscribed for shares. His Honour gave judgment for the amounts claimed, with costs in each case.—From the "Dorset County Chronicle and Somersetshire Gazette," March 18, 1926.

MISCELLANEOUS NEWS.

GAS REGULATION ACT APPLICATIONS.

There have appeared in the "London Gazette" the following notices regarding applications to the Board of Trade under the Act.

AMENDING ORDER.

Walton-on-Thames and Weybridge Gas Company.

The Middlesex County Council have applied to the Board of Trade for an Amending Order substituting a maximum price of 16·5d. per therm for the Company's existing maximum price of 20d. per therm.

SPECIAL ORDER.

Borough of Nelson.

The maximum prices now authorized in respect of the supply of gas by the undertakers are 5s. per 1000 ft. in the borough and 5s., 5s. 3d., and 5s. 6d. outside; and the prices they have asked the Board of Trade to substitute for these are (for 5s. per 1000 c.ft.) 14·12d. per therm, (for 5s. 3d.) 14·82d., and (for 5s. 6d.) 15·53d.—with an additional charge of 0·23d. per therm in respect of gas supplied through a prepayment meter.

GOVERNMENT ELECTRICITY SCHEME.

Sir John Snell and the Gas Industry.

Speaking at the annual dinner of the British Electrical Development Association at the Hotel Cecil on Friday, March 19, Sir John Snell, the Chief Electricity Commissioner, remarking on the fact that the average consumption of electricity per head of the population in the United States was 500 units, whereas in this country it was only a quarter of that amount, or 118 units, said it was abundantly clear that they had considerable leeway to make up. It was no effective argument against the figure of 500 units per head of population per annum in the United States to say that in Great Britain there was a great gas industry, in which some £170,000,000 had been invested—an industry which, he agreed, is excellently managed and is of great benefit to the community. There were large gas undertakings in the United States also. In Chicago, for example, both the electricity and the gas undertakings were pre-eminently successful concerns, and both were growing and developing in a remarkable degree. The gas undertaking in Chicago sold 10,000 c.ft. per head of population in 1923, which might be compared with 9000 c.ft. per head sold by the Gas Light and Coke Company. The fact, therefore, that a successful gas supply existed in the urban areas of this country, he continued, was no obstacle to a great development of electricity supply. There was room for both. Indeed, the competition between them was good, giving rise to fertility of invention and enterprise in development on the part of both industries. To take a reasonable survey of our future requirements, they had, therefore, to envisage the period when the public consumption of electricity per head of population per annum would be not, as now, only 118 units, but 500 units. He believed they would reach a much higher figure if every effort was made to bring the electricity supply industry to the highest level of efficiency possible, instead of continuing along the haphazard lines adopted in the past. It was the aim of the new scheme to bring this about; and he asked all concerned to come forward with constructive criticisms of the Government proposals, so that the Bill might be added to the Statute Book in a form which would ensure the highest and best development.

Mr. R. B. Mitchell (City Electrical Engineer at Glasgow, and President of the Incorporated Municipal Electrical Association) said it might be a pity that a great deal of the load which would be acquired by the greater development of electricity supply must come from the gas industry; but in his opinion this was inevitable. So far, the British public had been bred to use gas, but he believed the new generation would not tolerate gas as it had been tolerated in the past, and more particularly would they object to having their food cooked in an atmosphere of gas fumes.

Major Isidore Salmon said he did not believe that a greater consumption of electricity necessarily meant less consumption of gas. There were great opportunities and great possibilities for both.

GAS COMPANIES' RESULTS IN 1925.

Further Sales Increases.

Alliance and Dublin.

The following is extracted from the report of the Directors of the Alliance and Dublin Consumers' Gas Company for the half-year ended Dec. 31 last: The accounts show a profit on the revenue account of £59,984; and after providing for interest on debenture stock and temporary loans there remains the sum of £51,720, to which must be added £10,002, being the balance brought forward from last account, and a credit from income-tax amounting to £2143, making a total of £63,866. The Directors recommend the declaration of the maximum statutory dividend on the consolidated ordinary stock of the Company, at the rate of £6 5s. p.ct. per annum, less income-tax. This will absorb the sum of £48,495, after which a balance of £15,370 will remain to be carried to the next account.

Burgess Hill.

At the annual meeting of the Burgess Hill and St. John's Common Gas Company, the Chairman (Lt.-Col. S. T. Manyard) said that the available balance on the year's working was £1291. The Directors recommended the payment of dividends of 7½ p.ct. on the original shares, and 5¼ p.ct. on the new ordinary shares, both less income-tax. This would leave a balance of £394 to be carried forward. He said that there had been a considerable increase in gas sales.

Colchester.

In our summary of the Directors' report of the working of the Colchester Gas Company for the year 1925 (*ante*, p. 706), there was a slight error in the concluding line. The words "per annum" should be deleted. The following dividends were declared for the past half-year: £6 7s. 6d. p.ct. on the "A" shares, and £4 9s. 3d. p.ct. on the "B" shares, both less tax. A similar dividend was declared and paid in respect of the half-year ended June 30, 1925. The dividends for the full year are, therefore, £12 15s. p.ct. on the "A" shares, and £8 18s. 6d. p.ct. on the "B" shares, both less tax.

Cromer.

The sale of gas, compared with that for the previous year, shows an increase of 5504 therms, or 3·7 p.ct. After providing for interest, income-tax, and all other charges, there remains a balance of profit of £2597 available for division. The Directors recommend the declaration of a dividend for the year ended Dec. 31 last of £5 10s. p.ct. (less income-tax). This will absorb £2442, leaving a balance of £155 to be carried forward.

Hexham.

At the annual ordinary meeting of the Hexham Gas Company, the Directors were authorized to issue additional ordinary stock to the amount of £10,000. The Chairman, Mr. William Pattinson, said that during the last year the consumption of gas had continued to increase, though the public lighting contract for the town had been lost. The new carbonizing plant had been in operation for six months, and had given greatly improved results. A dividend was declared of £6 p.ct. (less income-tax) on the ordinary stock of the Company, inclusive of the interim dividend paid in September last. A balance of £923 was carried forward.

Sevenoaks.

The report for 1925 of the Sevenoaks Gas Company stated that the consumption of gas had continued to grow, and showed the record figure of 11¼ million c.ft. increase over the previous year. Dividends, less income-tax, were declared at the rates of 10 p.ct. on the "A" shares and 7 p.ct. on the "B" shares, leaving £8993 to be carried forward. To cope with the increasing demands for gas, the Company have entered into a contract with Messrs. Gibbons Bros. for a new retort house, at a cost of about £15,000.

Sheppy.

In their report for the year ended Dec. 31 last, the Directors state that the sales of gas have been very satisfactory, exceeding those of last year by 6·6 p.ct. The improved method of manufacture at the works enabled the Directors to reduce the price of gas 1d. per therm. A large number of cooking, heating, and other gas appliances have been fixed, and the demand is being maintained. Interim dividends were paid at the maximum rates for the half-year ended June 30, 1925, of 4 p.ct. per annum on the "A" preference shares, and at 5 p.ct. per annum on the consolidated ordinary stock, both less income-tax; and the Directors recommended that similar dividends be paid for the half-year ended Dec. 31.

Shotley Bridge and Consett.

At the annual meeting of the Shotley Bridge and Consett District Gas Company, a final dividend of 5 p.ct. was declared, leaving a balance to carry forward of £6682. The profit for the year was £11,774. The Chairman (Lieut.-Col. W. H. Kitson) said a reduction in the price of gas of 1·2d. per therm was made during the year; and the Directors hoped duly to grant further concessions. Speaking of the Government's electricity scheme, he said the principal reason for it was that in this country people did not use so much electricity per head of the population as in America, Switzerland, Canada, and Norway. This was perfectly true; and it was doubtful if they ever would. The countries with the highest electricity consumption per head of population were those with large quantities of water power available, and where coal was more expensive than here. The electricity undertakings in the Company's area were sparing no effort to push the sale of current; and yet last year they had an increased sale of gas of 5·06 p.ct., on top of an increase of 10·6 p.ct. in the previous year.

Solihull.

In moving the adoption of the Directors' report at the annual meeting of the Solihull Gas Company, Mr. Edmund Allday stated that the increased demand for gas during the year was so great that the Directors had consulted Mr. George Evetts, of London, as to the best method of making the necessary extensions. They were advised that additional carbonizing plant was necessary. The contract had been placed, and it was anticipated that the work would be completed in August next. The year's trading had been a record.

Southend.

Moving the adoption of the report and accounts for the year ended Dec. 31 last, the Chairman (Mr. J. H. Burrows, J.P.), at the annual meeting, said that the continued growth of Southend-on-Sea and district had brought with it a substantial demand for more gas. The Company were now within hail of the 1000 million c.ft. sale mark, after 72 years' existence as a Company. They hoped to reach it during this year, or shortly after. This growth had made necessary substantial capital expenditure, and, on balance, that figure had been increased by £25,941. The capital per unit of gas sold was satisfactory. It was the determination of the Board, as from the next reading of ordinary meters, to reduce the ordinary price of gas from 4s. 3d. to 4s. 2d. per 1000 c.ft. On the proposal of Mr. A. Talbot, seconded by Mr. R. Robertson, the following dividends were declared payable: 6⅞ p.ct. per annum on the original new ordinary stock; 6 p.ct. on the new ordinary "B"; 7 p.ct. on the 7 p.ct. redeemable preference; and 5¼ p.ct. on the 5¼ p.ct. irredeemable preference. After the customary thanks to the Board, officials, and staff, the meeting resolved to give £1000 to the Southend Hospital Fund.

St. Austell.

A reduction in the price of gas was foreshadowed at the annual meeting of the St. Austell Gas Company, when dividends were declared at the rate of 8½ p.ct. on the old shares and 7 p.ct. on the new. Mr. S. J. Ingram, who is a Director, made a reassuring statement on the present position of affairs as affecting the gas industry.

Woking.

Moving the adoption of the report and accounts at the half-yearly meeting of the Woking District Gas Company, Mr. Lawrie Trewby (Chairman and Managing Director) drew attention to the fact that the gas sold showed an increase of 7·78 p.ct. If they took into account the first half of the year, the increase was 8¾ p.ct. Coming to the capital account, the Company had spent rather heavily on new mains (£2500), which was due to the Ripley extension. But, taking off the depreciation (£883), it showed they had only added the net amount of £1900. Capital and interest charges only cost them 14·1d., as against 16·2d. two years ago. In the revenue account, the cost of coal and oil was a little lower than last year. For the repair of works the Company had again taken £1500 from the suspense account, leaving the figure at £10,500. If they could carry that figure on each half-year, the suspense account would soon disappear. Sale of gas was up by £1500. The residual products were down only by £250. Dividends were recommended at the rate of 6 p.ct. on the "A" and "B" ordinary stocks, 5 p.ct. on the "C" preference stock, 5 p.ct. on the 5 p.ct. redeemable preference stock, and 8 p.ct. on the 8 p.ct. redeemable preference stock; leaving £3018 to be carried forward.

TRADE NOTES.

Tar Plant for Barnstaple.

Messrs. Clayton, Son, & Co., Ltd., have received an order from the Barnstaple Gas Company for one of their "Cascade" system tar dehydration plants, having a capacity of 10 tons per day. In addition to this, they are sending out a similar plant to the order of the Osaka Gas Company, Japan.

Prepayment Meter Padlocks.

The Anglo-American Lock Company, of Willenhall, have prepared a blotter illustrating a few of their leading lines in prepayment meter padlocks. They will send blotters to any gas company or department who care to write for them. It is interesting to note that all the locks are British made.

Lifting Devices.

Messrs. Herbert Morris, Ltd., of Loughborough, have published a booklet dealing in an attractive way with Morris worm-gear pulley-blocks. It is not generally realized how much care and thought go to the construction of a modern pulley-block, so that the illustrations of the various manufacturing processes are both interesting and informative. The method of testing with a 50 p.ct. overload by means of measured weights is graphically presented.

CONTRACTS OPEN.

Gasholder Painting.

Tenders are invited by the Macclesfield Gas Department for the painting of two gasholders. [See advert. on p. 767.]

Vertical Retorts.

Tenders are invited by the Borough of Middleton for the supply and erection of vertical retorts with coal and coke bunkers. [See advert. on p. 767.]

NORTH-EAST COAST COAL TRADE.

From our Own Correspondent.

The market is experiencing a period of waiting, and business in the meantime is slow. Both buyers and sellers are holding off for forward trade, until there is some indication as to how the affairs of the industry are likely to go.

There is considerably more tonnage available; much of the delayed shipping having come to hand during the last week. Good quality collieries are mostly in a very strong position for prompt, and in the majority of cases sufficiently well sold for April to hold available balances; and consequently they are not quoting, or else are indicating prices which do not, at present, bring business. Seconds and others have not been so well placed, and have been rather weak even for prompt shipment. But they, too, are not inclined to do April business at current rates.

Best gas coals have been firm throughout, and Wear Specials quote steadily at 19s. to 19s. 6d. f.o.b., while best qualities maintain 18s. Seconds are 14s. 6d. to 14s. 9d., and in good supply. Coking coals are weak again, and in poor demand, 14s. 6d. to 15s. being quoted. Best Durham bunkers are firm at 16s., but seconds are weak.

Trade is likely to be slow until there are further developments in the situation, and the outlook is very difficult to gauge. Sellers are anticipating that the issue will be in doubt at any rate for some time to come, and that the tendency will be towards bigger demand and harder markets.

YORKSHIRE AND LANCASHIRE COAL TRADE.

From our Local Correspondent.

House coals in Yorkshire and Lancashire are moving out steadily, and merchants do not experience any difficulty in executing orders promptly. As a result, prices are inclined to be a shade easier.

The industrial outlook is concerned with the outcome of the report of the Coal Commission, although in the present state of things it does not appear that fuel of any description will be cheaper. The market for forward sales is therefore cramped; and with collieries unable in many instances to quote ahead, the situation is extremely difficult.

Gas contracts are being concluded with reductions of 1s. 6d. to 2s. on last year's prices, and present supplies are moving forward in the ordinary way.

The export situation continues very obscure, and foreign competition is being severely felt on this side.

The following represents the Humber bunker and export prices (f.o.b. usual shipping ports): South Yorkshire—Hards, Association, 20s. 9d.; washed trebles, 20s. to 20s. 6d.; washed doubles, 19s. 6d.; washed singles, 17s. to 17s. 6d.; washed smalls, 12s. 3d.; rough slack, 9s.; smithy peas, 19s. 6d. to 21s. 7d. West Yorkshire—Hartleys (f.o.b. Goole), 17s. 6d. to 18s. 6d.; washed trebles, 18s. 6d.; washed doubles, 17s. 6d. to 18s.; washed singles, 16s. 6d. to 17s.; washed smalls, 12s. to 12s. 3d.; unwashed trebles, 16s. 6d. to 17s.; unwashed doubles, 13s. 6d. to 14s.; coking smalls, 9s. 6d. to 10s. Derbyshire and Nottinghamshire—Top hards, 20s. 6d. to 22s. 6d.; washed singles, [illegible]s. to 17s. 6d.; washed nalls, 11s. 6d.; rough slack, 9s. 3d. to 9s. 9d. Yorkshire, Derbyshire, and Nottinghamshire—Screened steam coal, 17s. 6d. to 18s. 6d.; gas coke, 20s. to 21s.; furnace coke, 16s. 6d. to 17s., all per ton.

COAL TRADE IN THE MIDLANDS.

From Our Local Correspondent.

The trade has continued sluggish, so sluggish indeed that intermissions of output have been lengthened. Outside the undertakings on which light, heat, power, and transport services depend, the market is inactive. The house coal trade has received only such slight stimulus as might be attributed to a lower temperature. There is little sign that the domestic consumer is taking serious thought for reserves. The advance of the season no doubt explains the apathy with which the crisis in the coal-getting industry is viewed in this direction. But the holding-off of the industrial user is not explicable on this ground. In weighing the hazards manufacturers appear to have concluded that there is less risk in letting events take their course than in insuring against untoward contingencies. Although speculation does not dismiss the chances of a rupture as too remote to be a practical factor in the outlook, it is judged better policy to defer precautions. April may develop another psychology. Stocks at wharves and on rail appear to be no more than normal. Collieries are not showing any adventurous tendency in the building-up of reserves. Production is amply sufficient for the absorptive capacity of the market, and values are easy.

Blast-furnace coke is 6d. to 1s. cheaper. The view that only a return to the eight-hour day can restore the stability of the industry is emphasized by Mr. W. G. Phillips, Chairman of the Warwickshire Coal Owners' Association.

Gibbons (Dudley), Ltd.—The annual report of the Directors states that the net profit for the year, after providing for depreciation, is £13,993, which, added to the amount brought forward from last year, £13,896, makes a total of £27,889. Of this, the full preference dividend, and the interim dividends of 7 p.c. per annum on the ordinary shares, already paid (all free of income-tax), absorbed £11,462, leaving £16,427. The Directors recommend a dividend of 3 p.c. per annum, free of tax, on the ordinary capital—which, with the interim dividends already paid, will make a total of 10 p.c. for the year—and that after payment of Directors' fees, &c., the balance be carried forward. The Directors report with regret the death of their esteemed Chairman and Managing Director, Mr. W. P. Gibbons, which took place in August last.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

London, *March* 22.

Pitch has been a little quieter during the past week, chiefly for the reason that makers have now practically nothing left to sell. The market, however, is quite firm, and 87s. 6d. per ton for prompt shipment is readily obtainable, while for October/December the market is firm at about 80s. per ton.

Considerable quantities of tar are already being taken for road purposes, and it looks as if there will be a record demand this season.

Creosote is steady at 7¾d. to 7¼d. per gallon net and naked at works.

Pure benzole and pure toluole are firm at about 2s. 2d. per gallon; 95/160 solvent naphtha is steady at 1s. 9d. to 1s. 10d. per gallon.

Pyridine is 20s. per gallon.

Tar Products in the Provinces.

March 22.

The market for pitch remains very firm; and the inquiry is still very good for this season's delivery, but a little quieter for next. Other products remain unchanged.

The average values for gas-works products during the week were: Gas-works tar, 57s. to 62s. Pitch, East Coast, 85s. to 87s. 6d. f.o.b. West Coast—Manchester, 77s. to 78s.; Liverpool, 78s. to 79s.; Clyde, 81s. to 82s. Benzole, 90 p.ct. North, 1s. 8½d. to 1s. 9½d.; crude, 65 p.ct., at 120° C., 1s. 1d. to 1s. 2d., naked at makers' works; 50-90 p.ct., naked, North, 1s. 8½d. to 1s. 9½d. Toluole, naked, North, 1s. 8d. to 1s. 9d., nominal. Coal-tar crude naphtha, in bulk, North, 8d. to 8½d. Solvent naphtha, naked, North, 1s. 5d. to 1s. 6d. Heavy naphtha, North, 11½d. to 1s. 0½d. Creosote, in bulk, North, liquid, 6½d. to 6¼d.; salty, 6d. to 6⅛d.; Scotland, 5⅞d. to 6d. Heavy oils, in bulk, North, 6⅞d. to 7d. Carbolic acid, 1s. 4d. to 1s. 5d. prompt. Naphthalene, £11 to £14; salts, £4 to £5, bags included. Anthracene, "A" quality, 2½d. per minimum 40 p.ct., purely nominal; "B" quality, unsaleable.

Imperial Continental Gas Association.

The Board of the Imperial Continental Gas Association will recommend at the Association's annual ordinary general meeting, to be held at the Cannon Street Hotel on May 12 next: That, subject to the verification of the accounts by the Auditors, there be paid, on May 20, a final ordinary dividend for the year ended Dec. 31, 1925, less income-tax at 4s. 1½d. in the pound, at the rate of 5 p.ct. (actual), making, with the interim dividend of 5 p.ct. (actual) paid on Nov. 16, a dividend of 10 p.ct. for the year. That the sum of £167,960, shown in the balance-sheet as received from the realization of the German assets, being an accretion to capital which has been realized and turned into money, be dealt with as profit, and applied in payment of a special dividend for the year 1925 at the rate of 8½ p.ct. per annum on the nominal amount of the issued capital stock of the Association, such dividend to be paid on May 20, upon the holdings of capital stock as registered in the books of the Association on April 20. The capital stock transfer books of the Association will be closed from April 20 to May 3, both dates inclusive.

Worthing Gas Light and Coke Company.—As announced in our advertisement columns to-day, Messrs. A. & W. Richards have been instructed by the Company to offer for sale by tender £27,195 5½ p.ct. irredeemable preference stock. The minimum price of issue is £92 per £100. Tenders should reach Messrs. Richards, 37, Walbrook, E.C. 4, not later than eleven o'clock on Wednesday, March 31.

Colonial Gas Association Capital Issue.—An excellent response has been made by shareholders of the Colonial Gas Association, Ltd., to the recent offer of 43,900 8 p.ct. preference shares and 100,330 ordinary shares. Taking into consideration the number of applications for excess shares, the issue (which was made at a premium of 1s. per share in respect of each class of share) was largely over-subscribed. Letters of allotment are being posted to the shareholders on the English register during the present week.

British Industries Fair, 1927.—In view of the success achieved by the British Industries Fair held last month in London and Birmingham, it has been decided to hold the Fair again next year at approximately the same time. Preparations for the Fair will be commenced at an earlier date than on any previous occasion. There are already many indications that there will be a very substantial increase in the number of exhibitors. Firms eligible to exhibit are therefore advised to intimate their intention at an early date. The Fair will be organized, as usual, in London by the Department of Overseas Trade and in Birmingham by the Birmingham Chamber of Commerce.

The Brixham Gas Company have agreed to accept the Urban District Council's offer of £800 for the whole of the lights in the district; the lighting to be up till 11 p.m.

The South Metropolitan Gas Company have placed an order for a cargo steamer of 2440 tons dead weight carrying capacity with Messrs. S. P. Austin & Son, Ltd., of the Wear Dockyard, Sunderland.

Under the auspices of the Bradford Corporation Gas Department, free demonstrations of gas cookery with "New World" cookers were given each afternoon and evening at the Bradford Mechanics' Institute from March 8 to 12. Miss M. Howells was the demonstrator.

The Dewsbury Corporation Gas Department are arranging to hold an exhibition of gas appliances—especially domestic—at the Town Hall, from April 22 to May 1. Miss Parkin will give lectures and demonstrations on gas cookery, and the "B.C.G.A." will have an exhibit on the subject of smoke abatement.

STOCK MARKET REPORT.

IN spite of several unsettling events last week—such as the breakdown of the League of Nations Conference, the unexpected collapse of the Belgian franc, and the further fall of the French franc—general conditions on the Stock Exchange were undisturbed.

Another batch of new issues appeared at the week-end, the principal of which was the £4,000,000 New South Wales Inscribed Stock at 98. It is interesting to note that the Commonwealth Government is now raising money in Australia at 5½ p.ct., which is about 2s. 6d. p.ct. above the rate at which money is obtainable on the London Market. Two years ago, the difference was 26s. p.ct.

In the Industrial Market, some excitement was caused by the rumour that Lever Bros. intended passing the dividend on the ordinary shares, which are privately held, and considerable selling of the preference shares took place. It is anticipated, however, that should the decision be made it will be with the view of strengthening the reserves. Tin shares are much in demand in consequence of the rise in the price of the commodity, which has touched £300 per ton, the best price since the year 1920.

A little more prominence was given to Gas Stocks by the improvement in the Gas Light and Coke ordinary by 4 points, to 81—83. It is anticipated that their application to the Board of Trade for an increased standard price will be successful; and should their new Bill, as promoted in the current session, become law, there should be a considerable improvement in the value of the stock. As will be seen from the Table, with the exception of the falls on *ex* div. quotations, prices generally were steady. Liverpool and Primitiva ordinary and Wandsworth (Wimbledon stock) were the only Companies to record slight depreciations.

The following transactions were recorded during the week:

On Monday, Bombay 18s. 6d., Bournemouth 5 p.ct. 12½ *ex* div., Brighton and Hove "A" 138, British 103½, Cape Town 4½ p.ct. cum. preference 6⅝, 6⅝, European 5⅞, Gas Light and Coke 77⅞, 78, 78⅛, 78¼, 78⅜, 4 p.ct. preference 74, 74½, 75, Imperial Continental 138, 139, Oriental 101, Primitiva 10s. 4½d., 10s. 7½d., 10s. 9d., South Metropolitan 90½, 91 *ex* div., Tottenham "A" 110. Supplementary prices, Colonial new ordinary 11s., 11s. 1½d.

On Tuesday, Bombay 19s. 3d., 19s. 6d., British 103, 104, Compania de Gas de la Habana 5 p.ct. bonds 99½, European 5⅞, Gas Light and Coke 78⅛, 78⅛, 79, 4 p.ct. preference 74, 74½, Imperial Continental 137, Portsea Island "D" and "E" 79½, 80 *ex* div., Primitiva 10s. 4½d., 10s. 6d., South Metropolitan 90½, 90½ *ex* div., South Suburban 5 p.ct. 95, 96½ *ex* div., Wandsworth (Wimbledon stock) 97 *ex* div. Supplementary prices, Crowborough consolidated 46, 46½, 6 p.ct. debenture 75.

On Wednesday, Alliance and Dublin 4 p.ct. debenture 61, Bournemouth original 12½ *ex* div., British 103, Commercial 4 p.ct. 76 *ex* div., 3 p.ct. debenture 56½, 57, Croydon maximum dividend 80½ *ex* div., European 5⅞, Gas Light and Coke 78⅜, 79, 79⅛, 79⅜, 79½, 80, Hongkong and China 20½, Imperial Continental 137½, 139, Oriental 101½, 102½, Primitiva 10s. 7½d., 4 p.ct. (River Plate) debenture 65½, 4 p.ct. debenture 1911 67, 67½, South Metropolitan 90½, 90½, 91, 91½ *ex* div., 3 p.ct. debenture 58½, 58½, Southampton 5 p.ct. maximum 79. Supplementary prices, Wandsworth new 88.

On Thursday, Gas Light and Coke 79½, 79⅝, 79⅞, 80, 80⅛, 80¼, 80⅜, 3½ p.ct. maximum 58, 4 p.ct. preference 74⅛, 3 p.ct. debenture 58, Imperial Continental 137, 139½, 140, Primitiva 10s. 3d., 10s. 6d., 10s. 7½d., South Metropolitan 90½, 91, 6½ p.ct. debenture 102½, South Suburban 5 p.ct. 96, Wandsworth (Wimbledon stock) 96. Supplementary prices, Colonial 8 p.ct. preference 21s. 9d., Peterborough consolidated 97⅜, 98⅛, Sheppy 5 p.ct. consolidated 78½, 79.

On Friday, Alliance and Dublin 72, Commercial 4 p.ct. 76, 77½, European 5⅛, 5⅜, 6, Gas Light and Coke 80½, 80¼, 80⅜, 81, 81⅛, 81⅜, 81¾, Imperial Continental 140, Montevideo 72, Primitiva 4 p.ct. debentures 83½, 84, South Metropolitan 91½, 91⅓, Southampton 79½ *ex* div. Supplementary prices, Gas Light and Coke 6 p.ct. Brentford debenture 103, 103½, Gravesend and Milton 64.

In Lombard Street the demand for short loans eased as the week closed. For new money 4½ p.ct. was usually paid, and at no time did the rate fall below 4 p.ct. The result of the Treasury Bill allotment was much as had been expected, being practically the same rate as the previous week. In consequence market discount rates remained steady.

The feature of the week in the Foreign Exchange Market was the collapse of the Belgian franc, which closed at 120⅝ as compared with 107.10 a week ago. The price, however, is improving; whereas on Saturday the French franc touched a new record of 137.85. Italian lire was quoted at 120.92½; and Sterling on New York was very steady at 4.86½.

The price of Bar Silver fell to 30½d. per oz., the lowest price since 1916. Gold remained unchanged at the nominal price of 84s. 11½d. per oz.

The Bank Rate is 5 p.ct., to which it was raised from 4 p.ct. on Dec. 3. Bankers' deposit rates are 3 p.ct. The deposit rates of the discount houses are 3 p.ct. at call and 3½ p.ct. at notice.

Issue.	Share.	When ex-Dividend.	Dividends. Prev. Hf.Yr	Dividends. Last Hf. Yr.	NAME.	Quotations. Mar. 19.	Rise or Fall.	Transactions Lowest and Highest Prices.
£			%p.a.	% p.a.				
171,978	Stk.	Feb. 4	5	5	Aldershot 5 p.c. max. C.	74—77	..	..
822,992	,,	,,	4	4	Do. 4 p.c. Pref.	69—74	..	..
1,551,868	,,	Oct. 8	6½	6½	Alliance & Dublin Ord.	69—73	..	72
374,000	,,	Jan. 7	4	4	Do. 4 p.c. Deb.	58—63	..	61
300 000	1	Oct. 22	1/7½	1/7½	Bombay, Ltd.	2—1	..	18/6—19/6
170 000	10	Mar. 4	8½	8½	Bournemouth 5 p.c.	13—13	..	12½—12¾
425,050	10	,,	7	7	Do. B 7 p.c.	12—12½	..	..
275,000	10	,,	6	6	Do. Pref. 6 p.c.	11—12	..	..
50 000	Stk.	Jan. 7	3	3	Do. 3 p.c. Deb.	55—58	..	..
163 025	,,	,,	4	4	Do. 4 p.c. Deb.	75—78	..	..
214,740	,,	Mar. 18	12	12	Brighton & Hove Orig.	167—172*	—5	..
214,200	,,	,,	9	9	Do. A Ord.	130—135*	—7	138
1,287,500	,,	July 23	5	5	Bristol 5 p.c. max.	89—91a	..	..
855,000	,,	Mar. 18	8	7	British Ord.	98—103*	—3	103—104
100,000	,,	Jan. 7	7	7	Do. 7 p.c. Pref.	117—122	..	..
120 000	,,	,,	4	4	Do. 4 p.c. Red. Deb.	69—74	..	..
100.000	10	Dec. 17	8	6	Cape Town, Ltd.	6½—7½	..	6⅝—6⅞
100,000	10	Nov. 5	4½	4½	Do. 4½ p.c. Pref.	6—7	..	..
150,000	Stk.	Jan. 7	4½	4½	Do. 4½ p.c. Deb.	68—73	..	..
626,860	,,	Feb. 18	6	6	Cardiff Con. Ord.	96—99	..	..
237,860	,,	Jan. 7	7½	7½	Do. 7½ p.c. Red. Deb.	98—101	..	..
157,150	,,	Mar. 4	5	6½	Chester 5 p.c. Ord.	87½—92½b	..	..
79.185	1	Oct. 8	—	2/-	Colombo Ltd. Ord.	25/—27/-	..	..
24.500	1	,,	—	1/4½	Do. 7 p.c. Pref.	21/—23/-	..	..
1,513.280	Stk.	Mar. 4	5½	5½	Commercial 4 p.c. Cap.	76—81	..	76—77½
560.000	,,	,,	5/3/¼	5/3/¼	Do. 3½ p.c. Cap.	76—81	..	..
475.000	,,	Dec. 17	3	3	Do. 3 p.c. Deb.	55—58	..	56½—57
800.000	,,	Oct. 8	—	4	Continental Union, Ltd.	33—38	..	..
200.000	,,	Mar. 4	7	7	Do. 7 p.c. Pref.	85—88	..	..
737.150	,,	Mar. 4	6½	6½	Croydon sliding scale	95—98	..	..
403,100	,,	,,	5	5	Do. max. div.	79—82	..	80½
492.270	,,	Mar. 4	6	9	Derby Con.	107—109c	..	..
55.000	,,	Dec. 17	4	4	Do. Deb.	74—76c	..	..
209,000	,,	Mar. 4	5	5	East Hull Ord. 5 p.c.	86—89	..	..
50.000	,,	Dec. 17	—	5	Eastbourne 5 p.c. Deb.	93—98	..	..
1,002,180	10	July 23	4	6	European, Ltd.	5⅞—6⅜	..	5⅞—6
16,413 285	Stk.	Feb. 18	5½	4/17/4	Gas Light & Coke 4 p.c. Ord.	81—83	+4	77⅞—81½
2,600,000	,,	,,	3½	3½	Do. 3½ p.c. max.	58—61	..	58
4.062 295	,,	,,	4	4	Do. 4 p.c. Con. Pref.	74—77	..	74—75
4,76 ,930	,,	Dec. 17	3	3	Do. 3 p.c. Con. Deb.	58—61	..	58
130.000	,,	—	10	10	Do. 10 p.c. Bonds	..	..	..
42 000	,,	—	7½	7½	Do. 7½ p.c. Ilford Deb	..	..	..
82,500	,,	Mar. 18	6½	6½	Hastings & St L. 5 p.c. Conv	88—93*	—2	..
258,740	,,	,,	5½	5½	Do. 3½ p.c. Conv.	68—78*	—3	..
70 000	10	Sept. 24	10	10	Hongkong & China, Ltd.	19⅝—20⅝	..	20½
86,800	Stk.	Mar. 4	10	10	Hornsey 7 p.c.	128—133	..	..
1,976 000	,,	Nov. 19	59	10	Imperial Continental Cap.	136—141	+1	137—140
226.170	,,	Feb. 4	3½	3½	Do. 3½ p.c. Red. Deb.	69—72	..	..
235.242	,,	Mar. 18	6½	6½	Lea Bridge 5 p.c. Ord.	95—100*	—2	..
2,127.340	,,	Feb. 18	5½	5½	Liverpool 5 p.c. Ord.	80—80½b	—1	..
600 000	,,	Mar. 18	7	7	Do. 7 p.c. Red. Pref.	101½—103½b*	—2½	..
165,736	,,	Feb. 18	9	8	Maidstone 5 p.c. Cap.	115—120	..	..
63.480	,,	Dec. 17	3	3	Do. 3 p.c. Deb.	54—59	..	..
75,000	5	Dec. 3	7	6	Malta & Mediterranean	4½—5	..	..
541,920	Stk.	Nov. 19	4	4	Montevideo. Ltd.	70—74	..	72
2,061,315	,,	Mar. 4	5	5	Newcastle & Gateshead Con.	73—74d	..	..
260 929	,,	,,	4	4	Do. 4 p.c. Pref.	75—76d	..	..
529,705	,,	Dec. 17	3½	3½	Do. 3½ p.c. Deb.	70—72d	..	..
15,000	,,	Mar. 4	11½	11½	North Middlesex 10 p.c.	155—160	..	..
91.530	,,	,,	8⅚	8⅚	Do. 7 p.c.	112—117	..	..
300,000	Stk.	Dec. 3	7	9	Oriental, Ltd.	98—103	..	101—102½
188.120	,,	Jan. 7	7¼	7¼	Plym'th & Ston'house 5 p.c.	110—115	..	..
60,000	50	Mar. 4	14	14	Portsea Island B	90—95	..	..
100,000	50	,,	13	13	Do. C	88—93	..	..
2 381,900	1	—	—	—	Primitiva Ord.	10/0—11/0	—/6	10/3—10/9
892.600	100	Dec. 1	4	4	Do. 4 p.c. Red. Deb.	82—84	..	83½—84
600,000	Stk.	Jan. 21	4	4	Do. 4 p.c R-d. Deb. 1911	66—68	..	67—67½
198,744	,,	Dec. 17	4	4	Do. B. Ai es 4 p.c. Rd. Db.	66—68	..	..
264,496	,,	,,	4	4	Do. R'r P'te 4 p.c. Rd. Db.	66—68	+1	65½
150,000	10	Mar. 18	6	6	San Paulo 6 p.c. Pref.	7⅞—8*	—¼	..
125.000	50	Jan. 4	5	5	Do. 5 p.c. Red. Deb.	43—46	..	..
270.000	Stk.	Aug. 27	5⅝	5⅝	Sheffield A	100—102e	..	..
419,968	,,	,,	5⅝	5⅝	Do. B	100—102e	..	..
1,047.000	,,	,,	5⅝	5⅝	Do. C	100—102e	..	..
50,000	10	June 11	6	4	South African	5—7	..	..
6.600,895	Stk.	Mar. 4	5	7	South Met. Ord.	90—92	..	90½—91½
1,895,115	,,	Jan. 7	3	3	Do. 3 p.c. Deb.	56—59	..	58½—58½
734.000	,,	Mar. 4	6½	6½	Do. 6½ p.c. Red. Db.	102—104	..	102½
91.500	,,	Mar. 4	8½	8½	South Shields Con.	121—123d	..	..
1,187.795	,,	Mar. 4	6½	6½	South Suburban Ord. 5 p.c.	95—98	..	95—96½
868.8 7	,,	Dec. 17	5	5	Do. 5 p.c. Deb.	94 97	..	..
647.740	,,	Mar. 18	5	5	South'mpton Ord. 5 p.c.max	76—79*	—2	79—79½
121,275	,,	Jan. 7	4	4	Do. 4 p.c. Deb.	69 74	..	..
250.000	,,	Mar. 4	7	7	Swansea 7 p.c. Red. Pref.	100—102	..	..
200,000	,,	Dec. 17	6½	6½	Do. 6½ p.c. Red. Deb.	100—102	..	110
150.000	,,	Feb. 18	7½	7½	Tottenham District A 5 p.c.	107—112	..	..
582.275	,,	,,	5½	5½	Do. B 3½ p.c.	86—91	..	..
150.000	,,	,,	28/4	5½	Do. 5½ p.c. Pref.	101—103	..	..
181.253	,,	Dec. 17	4	4	Do. 4 p.c. Deb.	74—77	..	..
258,251	,,	Mar. 18	5	5	Tynemouth Con. and New	67—68d*	—2	..
197.294	,,	Mar. 4	6⅝	6⅝	Uxbridge, Maidenhead, & Wycombe 5 p.c.	90—95	..	..
88.830	,,	,,	5	5	Do. 5 p.c. pref.	85—90	..	..
91,800	,,	,,	6⅝	6⅝	Do. 5 p.c. Maidenh'd	87—92	..	..
					Wandsworth, Wimbledon, and Epsom—			
80.000	,,	Mar. 4	8½	8½	Wandsworth A 5 p.c.	128—128	..	..
285.636	,,	,,	7	7	Do. B 5 p.c.	103—103	..	..
412.450	,,	,,	5/19/0	5/19/0	Do. C and New	88—93	..	88
852.0 0	,,	,,	6⅝	6⅝	Wimbledon 5 p.c.	95—100	—2	96—97
98.900	,,	,,	7½	7½	Epsom 5 p.c.	105—110	..	..
93,416	,,	Jan. 7	3	3	3 p.c. Deb.	55—58	..	..

Quotations at:—a.—Bristol. b.—Liverpool. c.—Nottingham. d.—Newcastle. e.—Sheffield. *Ex. div.

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